6th National Workshop for Driver Rehabilitation Specialists

PROCEEDINGS May 2004

English

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Français

Glenrose Rehabilitation Hospital
Edmonton, Alberta

6e Atelier canadien pour les spécialistes de la réadaptation à la conduite automobile

COMPTE RENDU Mai 2004

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GLENROSE Rehabilitation Hospital | Capital Health

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6th National Workshop for
Driver Rehabilitation Specialists

Notices

This workshop was hosted by:

- Glenrose Rehabilitation Hospital

and sponsored by:

- Transport Canada and Capital Health Authority of Alberta

The contents of these proceedings reflect the views of the speakers and not necessarily those of the sponsors.

The presentations appear in the language in which they were delivered.

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6e Atelier canadien pour les spécialistes de la réadaptation à la conduite automobile

Avis

Cet atelier était organisé par :

- Glenrose Rehabilitation Hospital

et parrainé par :

- Transports Canada et Capital Health Authority de l'Alberta

Le contenu de ce compte rendu reflète les vues exprimées par les conférenciers et pas nécessairement celles des parrains.

Les présentations sont fournies dans la langue dans laquelle elles ont été effectuées.

Ce CD-ROM a été conçu et réalisé par le Centre de développement des transports de Transports Canada.

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16. Abstract

These proceedings contain the presentations given at the Sixth National Workshop for Driver Rehabilitation Specialists held in Edmonton, Alberta, 27-29 May 2004. This workshop was sponsored by Transport Canada and by the Capital Health Authority of Alberta.

Topics of the workshop included predicting driving ability, the Cognitive Behavioural Driver's Inventory, standardization of driver assessments, and driving simulation. Abstracts are provided in both official languages.

The workshop was attended by about 100 professionals, including occupational therapists, clinical researchers, vehicle modifiers, driving instructors, university professors, and representatives from various government agencies.

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16. Résumé

Ce compte rendu renferme les présentations effectuées lors du Sixième Atelier canadien pour les spécialistes de la réadaptation à la conduite automobile, lequel s'est déroulé à Edmonton, en Alberta, du 27 au 29 mai 2004. Cet atelier était parrainé par Transports Canada et la Capital Health Authority de l'Alberta.

Parmi les sujets abordés à cet atelier, notons la prévision de la capacité de conduire, l'inventaire cognitivo-comportemental des conducteurs, la normalisation de l'évaluation des habiletés de conduite et la simulation de conduite. Les résumés sont fournis dans les deux langues officielles.

Quelque 100 professionnels ont pris part à l'atelier, y compris des ergothérapeutes, des cliniciens, des gens spécialisés dans la modification de véhicules, des moniteurs de conduite, des professeurs d'université de même que des représentants de différents organismes gouvernementaux.

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6th National Workshop for
Driver Rehabilitation Specialists

Introduction

Welcome

Lorna Reimer
Glenrose Rehabilitation Hospital (Edmonton, Alberta)

Capital Health welcomes driver rehabilitation specialists, researchers, regulators and interested others involved in driving following disability or disease to the 6th National Workshop for Driver Rehabilitation Specialists. Being able to drive provides a sense of freedom and independence that allows us to participate in the community and world around us. Driver rehabilitation specialists help to put individuals following disability or disease on the road again or even for the first time. They play an important role in improving access, safety and quality of life for many in our communities.

The Workshop agenda is filled with presentations of scientific, technical and regulatory knowledge on driver assessment and rehabilitation. The exhibits will display a variety of resources for driver rehabilitation including the latest driver technology and vehicle adaptations available. This Workshop will help you keep up-to-date on the latest trends, knowledge and resources in the field.

We also welcome you to Edmonton, and invite you to discover new sights along with such favourites as shopping, sports, arts, dining, recreation and attractions. You'll enjoy the cityscape and the beautiful natural areas in and around the city including the river valley, the largest urban forest in the world. Edmonton's charm lies in its balance of sophisticated and exciting events, engaging attractions and friendly ease.

We are very pleased to host this event, and to learn and network with you.

Workshop Planning Committee

Lorna Reimer
Manager, Occupational Therapy Service
Glenrose Rehabilitation Hospital
Edmonton, AB

Vivian Hrynko
Occupational Therapist, CDRS
Coordinator – Driver Evaluation and
Training Service
Glenrose Rehabilitation Hospital
Edmonton, AB

Ingrid Barlow
Clinical Researcher/Occupational
Therapist
Glenrose Rehabilitation Hospital
Edmonton, AB

Don Simoneau
Occupational Therapist
Glenrose Rehabilitation Hospital
Edmonton, AB

Hazel Sutherland
Manager, Education Services
Glenrose Rehabilitation Hospital
Edmonton, AB

Larry Bowen
CDRS
Coordinator, Driver Rehab Centre
George Pearson Centre
Vancouver, BC

Clare Malcolm
Occupational Therapist, CDRS
Foothills Medical Centre
Calgary, AB

Allan Funk
Clinical Leader/Occupational Therapist
Foothills Medical Centre
Calgary, AB

Elaine Finseth
Occupational Therapist
Tofield, AB

Corresponding Committee Members

Carol Morrison
Occupational Therapist, CDRS
Stan Cassidy Centre for Rehabilitation
Fredericton, NB

Judy Brodie
Occupational Therapist, CDRS
QEII Health Sciences Centre
Halifax, NS

Janine Possberg
Occupational Therapist
Saskatoon City Hospital
Saskatoon, SK

Brian Marshall
Chief, Special Programs Division
Transportation Development Centre
of Transport Canada
Montreal, QC

Dina Iwanycky
Chief, Communications and Library
Services
Transportation Development Centre
of Transport Canada
Montreal, QC

Introduction

Bienvenue

Lorna Reimer
Glenrose Rehabilitation Hospital (Edmonton, Alberta)

Capital Health invite les spécialistes de la réadaptation à la conduite automobile, les chercheurs, les responsables de la réglementation et les autres personnes intéressées à la reprise de la conduite après une maladie ou une incapacité, au 6e Atelier canadien pour les spécialistes de la réadaptation à la conduite automobile. Être capable de conduire un véhicule donne une liberté et une autonomie qui facilitent grandement l'intégration à la collectivité et au monde en général. Les spécialistes de la réadaptation à la conduite automobile sont là pour aider les personnes frappées par une maladie ou une incapacité à reprendre le volant,

quand ce n'est pas pour leur apprendre simplement à conduire. Ils jouent un rôle crucial dans l'amélioration de la mobilité, de la sécurité et de la qualité de vie de beaucoup de gens.

Le programme de l'atelier comprend une foule d'exposés qui feront le point sur les connaissances scientifiques, techniques et réglementaires touchant l'évaluation des habiletés et la réadaptation. Des stands sont aussi prévus, où seront présentés divers équipements utiles pour la réadaptation à la conduite, notamment les dernières innovations en matière d'aides à la conduite et de dispositifs de modification des véhicules. Bref, l'atelier vous permettra de faire le point sur les dernières tendances, connaissances et nouveautés dans le domaine.

Nous sommes également heureux de vous accueillir à Edmonton, où vous pourrez découvrir de nouveaux paysages tout en vous adonnant à vos activités préférées – magasinage, sports, expositions, restaurants, détente, attractions. Vous serez séduit par le paysage urbain d'Edmonton et par la nature, omniprésente. C'est d'ailleurs à Edmonton que l'on trouve la plus

grande superficie de forêt urbaine du monde. Le charme d'Edmonton est fait d'un heureux mélange de manifestations raffinées, d'attractions intéressantes et de convivialité.

Nous sommes très heureux d'être les hôtes de cette manifestation. Nous avons hâte de vous y rencontrer et d'échanger avec vous.

Comité organisateur de l'atelier

Lorna Reimer
Chef, Service d'ergothérapie
Glenrose Rehabilitation Hospital
Edmonton, Alb.

Vivian Hrynko
Ergothérapeute, CDRS
Coordonnatrice, Service d'évaluation
et de formation
Glenrose Rehabilitation Hospital
Edmonton, Alb.

Ingrid Barlow
Spécialiste en recherche
clinique/ergothérapeute
Glenrose Rehabilitation Hospital
Edmonton, Alb.

Don Simoneau
Ergothérapeute
Glenrose Rehabilitation Hospital
Edmonton, Alb.

Hazel Sutherland
Chef, Services éducatifs
Glenrose Rehabilitation Hospital
Edmonton, Alb.

Larry Bowen
CDRS
Coordonnateur, Driver Rehab Centre
George Pearson Centre
Vancouver, C.-B.

Clare Malcolm
Ergothérapeute, CDRS
Foothills Medical Centre
Calgary, Alb.

Allan Funk
Responsable clinique/ergothérapeute
Foothills Medical Centre
Calgary, Alb.

Elaine Finseth
Ergothérapeute
Tofield, Alb.

Membres correspondants du Comité organisateur

Carol Morrison
Ergothérapeute, CDRS
Stan Cassidy Centre for Rehabilitation
Fredericton, N.-B.

Judy Brodie
Ergothérapeute, CDRS
QEII Health Sciences Centre
Halifax, N.-É.

Janine Possberg
Ergothérapeute
Saskatoon City Hospital
Saskatoon, Sask.

Brian Marshall
Chef, Programmes spéciaux
Centre de développement des
transports de Transports Canada
Montréal, Qué.

Dina Iwanycky
Chef, Communications
et Bibliothèque
Centre de développement des
transports de Transports Canada
Montréal, Qué.

6th National Workshop for Driver Rehabilitation Specialists

Presentations

Friday, May 28, 2004

Disabilities-Drugs-Driving
Renee Tyree Gross (*Ability Driver Rehabilitation Services*)

The DriveABLE Competence Screen as a Predictor of On-Road Driving
Susan Sofer (*A.C.T. Inc.*)

Predictors of Driving Ability Post-Stroke: A Systematic Review
Shawn Marshall (*CanDRIVE*)

Correlation Between Visual Perceptual Testing and On-Road Performance
Linda Johnson (*Winnipeg Health Sciences Centre*)

Driving With Bioptics
Micheline Descent (*Institut de réadaptation en déficience physique de Québec*)
Jean-Pierre Gagnon (*Société de l'assurance automobile du Québec*)

Presentations

... continued

Is Specialized Training in Driving Evaluation and Retaining Needed?
Dana Benoit (*Constance Lethbridge Rehabilitation Centre*)
Isabelle Gélinas (*McGill University*)

Validity of the Cognitive Behavioral Driver's Inventory in Predicting Driving Outcome
Louise Bouillon (*Jewish Rehabilitation Hospital*)

L'influence de l'administration partielle du *Cognitive Behavioral Driver's Inventory* sur sa validité de critère : une étude exploratoire et rétrospective
Josée Duquette (*Constance Lethbridge Rehabilitation Centre*)

The International Classification of Functioning, Disability and Health (ICF): Considerations for the Driving Rehabilitation Specialist
Brenda H. Vrkljan (*University of Western Ontario*)

Assessing Metacognition – A Structured Interview Format
Sue Reil (*Community Therapists Inc*)

Assessing Scanning – A Dynamic Approach
Lisa Kristalovich (*Community Therapists Inc*)

Saturday, May 29, 2004

CanDRIVE

Malcolm Hing, Shawn Marshall (*CanDRIVE*)

What Is Required for 'Standardization' in Driver Assessments?

Allen R. Dobbs (*University of Alberta*)

Canadian Consensus Meeting on Driving Evaluation in Older Drivers

Nicol Korner-Bitensky (*McGill University*)

Survey of Driving Professionals: What Is Being Used for Off- and On-Road Testing?

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Driving Simulation: A Pilot Study of Persons with Brain Injury and Matched Controls

Erica B. Stern (*University of Minnesota*)

Presentations

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Concurrent Validity of a Virtual Reality Driving Assessment for Persons with Brain Injury

Linda Hirsekorn (*Community Therapists Inc.*)

Dementia and Driving Cessation: An Overview of the Development of Group Interventions for Patients and Caregivers, and Preliminary Results

Bonnie M. Dobbs (*University of Alberta*)

6e Atelier canadien pour les spécialistes de la réadaptation à la conduite automobile

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Disabilities-Drugs-Driving

Renee Tyree Gross
Ability Driver Rehabilitation Services (Tucson, Arizona)

Abstract

Driver rehabilitation professionals work with clients taking a variety of medications. Persons with disabilities and the elderly are likely to be taking two or more classes of medications. The known effects of these medications, as well as the effects of combining these medications, affect our clients' abilities and driving outcomes. An understanding of how medications work in the body and knowledge of the more commonly prescribed medications in rehabilitation will assist the driver rehabilitation specialist in the driver evaluation and training process.

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DISABILITIES-DRUGS-DRIVING

WORKSHOP FOR DRIVER REHABILITATION SPECIALISTS

MAY 2004

Objectives

- To become familiar with drugs and drug classes commonly used by persons with disabilities.
- To gain an understanding of the pharmacology – how drugs work, move through the body and are eliminated.
- Understand the importance of conducting a thorough medication history – what questions to ask, utilizing drug reference materials and interpreting medication history and its relationship to driving performance and outcome.

Background

- Medications are instrumental in enjoying longer and better lives.
- Drugs other than alcohol and illicit drugs can affect the ability to drive.
- Legal drugs such as pain remedies or blood pressure medications by prescription or over-the-counter can also affect driving.

- Clients typically are taking medications for their medical condition(s).
- Drugs may actually assist the user in being a functional driver.

Additional Considerations

- Multiple drug use
- Age
- Fatigue
- Alcohol
- Medication/condition related factors
- Herbal/natural supplements
- Substance abuse

Medication History

A drug history is a critical component of your client's medical history.

The information obtained can assist the Driver Rehabilitation Specialist determine whether medications may influence the driving rehabilitation process.

What To Ask?

For each drug including prescription, over-the-counter and herbal remedies determine:

- Name
- Indication/reason
- Administration route
- Frequency of administration
- Duration of therapy
- Adverse reactions or effects the client may be experiencing(whether expected or not)
- Physician prescribing
- Last changed

Also -

- Tobacco
- Alcohol
- Caffeine
- Illegal substance use or abuse history

How Drugs May Impair Driving

- Seemingly harmless drugs such as allergy medications, cough syrups and pain relievers can impair driving.

- The same drug that did not impair you when you were younger can suddenly do so as you age.

Different Drugs Impair People Differently and in a Variety of Ways

- Slower reaction time
- Alteration of depth perception
- Hyperactivity
- Reduction of peripheral vision
- Confusion
- Drowsiness
- Lack of awareness of surroundings
- Accuracy of movements
- Ability to perceive hazards and identify risks

Additional Considerations -

- Every drug has a usual dosage range, certain factors such a client's age, weight, culture, gender and ethnicity or renal function may require a dosage adjustment.

- Compliance - Medication treatments are not effective if the drugs are not taken.

- Proper use of medication is a critical factor for safety.

Aging

- Age produces certain changes in body composition and organ function and presents unique dosing requirements.

- Elderly clients are more likely to have multiple illnesses and be taking multiple drugs and have an increased risk of a drug interaction.

Pharmacy 101

Terminology

- **Drug -** is any substance, natural or synthetic, which when taken into the body, is intended to bring a change in medical, behavioral, or perceptual states for either therapeutic or non-medical purposes.

- **Pharmacology -** is the science that deals with the physical and chemical properties and physiologic effect of medications.

- **Pharmacokinetics** – is the study of a drug's actions as it passes through the body during absorption, distribution, metabolism and excretion.

- **Therapeutics** – is the study of how drugs are used to prevent or treat conditions.

Drug Responses -

- **Desired Effect** - Is the intended or expected clinical response.
- **Adverse Reaction** -Is ANY unintended response to a drug. Adverse reactions associated with excessive amounts of a drug are considered drug overdoses.
- **Idiosyncratic Response** -The unusual response that occurs in a particular patient.
- **Allergic Reaction-** Is an adverse response that results from a previous exposure to the same drug or one that is chemically similar to it. The immune system reacts to the drug as if it were a foreign invader and may produce a hypersensitivity reaction.
- **Drug Interaction-** Occurs when one drug given concurrently with another and alters the pharmacokinetics or metabolism of the drug.

Medication Nomenclature

Most drugs are known by several names

- Chemical
- Generic
- Trade
- Official

Example – Baclofen

Chemical Name –

Gama-amino butyric acid (GABA) chlorophyll derivative

Generic Name –

Baclofen

Trade Name –

Lioresal

Drug Classification

- Therapeutic Use
  antidepressant

- Mechanism of Action (therapeutic subgroup) -
  tricyclic antidepressant
  seratonin re-uptake inhibitor

- Functional Classification
  psychotherapeutic

THERAPEUTIC DRUG CLASSIFICATIONS

- Drugs can be associated with characteristics of a classification.

- Based on these characteristics, you may be able predict the actions, side effects and interactions.

EXAMPLES

- Cardiovascular
- Antidepressants
- Analgesics
- Antibiotics
- Hormonal
- Herbal supplements

Cardiovascular Medications

- Heart Failure
- Hypertension
- Angina
- Arythmias

Medications Include:

- Furosemide(Lasix) - Diuretic
- Hydrochlorothiazide - Diuretic
- Clonidine (Catapress) - Adronergic agonist
- Prazozin(minipress)- Alpha blocker
- Atenolol (Tenormin)- Beta blocker
- Captopril (Capoten) - Ace inhibitor

Undesirable Effects May Include:

- Dehydration
- Hyperglycemia
- Decreases sodium, potassium, raises calcium
- GI distress
- Increased urination
- Drowsiness
- Dry mouth
- Headache
- Hypotension
- CNS depression
- Sedation
- Dizziness

Central Nervous System Medications CNS

- Tricyclic antidepressants
- Antianxiety
- Anticonvulsants
- Antiparkinson
- Opioid Analgesics
- Muscle Relaxants

- There are numerous pathways in the brain that use the same neurotransmitter.

- CNS drugs are notorious for causing a variety of side effects.

Medications Include:

- Amitryptilline (Elavil)
- Nortryptilline (Pamelor)
- Phenobarbital
- Valium
- Phenytoin (Dilantin)
- Carbamazepine (Tegretol)
- Gabapentin (Neurontin)
- Levodopa/Carbidopa
- Baclofen (Lioresal)
- Zanaflex (Tizanidine)
- Morphine
- Oxycodone

Undesirable Effects May Include:

- Dizziness
- Sedation
- CNS depression
- Respiratory depression
- Hypotension
- Ataxia
- Double vision
- Headache
- Difficulty concentrating
- Dry mouth
- Decreased coordination
- Decrease appetite
- Confusion
- Dysarthria

Spinal Cord Injury

- Medications are used to treat symptoms and conditions secondary to the injury such as spasms and infections.

Common Medications

- Antispasmotics: Baclofen, Zanaflex, Valium
- Antidepressants: Prozac, Elavil, Paxil
- Aalgesics: Perocet, Oxycontin
- Ditropan
- Coumadin
- Antibiotics: Cipro, Bactrim
- Neurontin

Multiple Sclerosis

- Medications used to slow disease progression, manage symptoms and acute attacks.
  - Copaxone (Glariamer)
  - Avone,Rebif
  - Betaseron (Interferon)
  - Novantrone (Mitoxantrone)

- Undesirable effects include:
  - Runny nose,
  - Tremor
  - Weakness
  - weight gain
  - Flu like symptoms
  - Depression
  - anxiety

Alzheimers

- Changes in the brain that characterize Alzheimer's disease begin long before people develop clinical symptoms such as memory loss.
- Patients with Alzheimer's disease show behavioral consequences (e.g., decline in memory and learning) that are partially related to cholinergic deficits.
- Treatments are focused on maintaining the choline levels in the brain.

Examples of Medications

- **Tacrine (Cognex**)- used for improving cognitive symptoms (i.e., memory, attention, reason, language, and the ability to perform simple tasks).

- **Aricept (Donepezil) -** used for the symptomatic management of mild to moderate forms of Alzheimer's disease.

- Undesirable effects are most commonly gastrointestinal disturbances occurred including: anorexia, constipation, dyspepsia and flatulence.

Additionally -

- Attention Deficit Disorder (ADD) – is characterized by short attention span, restlessness, distractibility, impulsivity and emotional lability.
- Amphetamine like drugs reduce these symptoms in greater than 80% of affected children.
- Psychomotor Stimulants:
  - Dexedrine
  - Methylphenidate (Ritalin)
- Undesirable effects are CNS over stimulation, restlessness, dizziness, insomnia and anorexia.

Drowsiness and Driving

- Many drugs carry warnings about drowsiness or dizziness.
- Drowsy driving is a serious problem and leads to thousands of accidents per year.
- Common prescription drugs can cause drowsiness including medications used to treat:
  - Allergies
  - Pain
  - Diabetes
  - High blood pressure
  - Depression
  - Insomnia
  - Ulcers

Seniors

- Older drivers need to be aware that medications can significantly impair their driving.
- As many as 50 percent do not take their medications as prescribed. Some do not fill their prescription, some fill, but don't take and others don't take the medication as directed.
- More than 80% of people aged 60 and over are prescribed one or more medications

- 30% of all prescription drugs are purchases by adults over 65. This age group also purchases 40% of all non-prescription drugs.

- 2/3 of all adults over 65 use one or more drugs daily.

- Older adults use an average of 3 prescriptions and no-prescription drugs at any one time. Drug-drug interactions become a particular concern.

- Chronic or multiple illnesses, which are common in older patients, may alter drug response.
- Older patients-even those with normal kidney and liver function have a reduced rate of drug metabolism and elimination compared with younger adults.
- Lower-than-recommended doses may be effective.

Objectives

- To become familiar with drugs and drug classes commonly used by persons with disabilities.
- To gain an understanding of the pharmacology – how drugs work, move through the body and are eliminated.
- Understand the importance of conducting a thorough medication history – what questions to ask, utilizing drug reference materials and interpreting medication history and its relationship to driving performance and outcome.

The DriveABLE Competence Screen as a Predictor of On-Road Driving

Susan Sofer
A.C.T. Inc. (Montreal, Quebec)

Abstract

Objective: To determine the ability of the DriveABLE Competence Screen to predict on-road driving outcome in subjects assessed for driving competence.

Study Design: This was a retrospective study of 52 individuals with varying health conditions who completed the DriveABLE Competence Screen and a standardized on-road driving evaluation. All subjects were tested in the same environment by the same set of evaluators using standardized testing procedures.

Measures: Pre-road driving competence was assessed using the DriveABLE Competence Screen. There are six subtests: motor speed and control,

attention shifting, executive function, complex judgment, attentional field, and component driving abilities. The results are classified into three categories: *recommended cessation of driving*, *indeterminate requiring on-road evaluation* and *no evidence of reduced competence*. The structured Road Test classified subjects as *pass*, *borderline pass*, or *fail*.

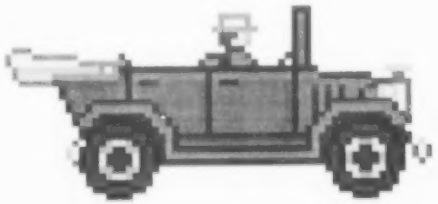
Primary Analyses: Sensitivity, specificity, and positive and negative predictive values were generated using the Road Test as the gold standard outcome.

Results: The results indicated that the positive predictive value of the DriveABLE Competence Screen in identifying those who would fail the on-road test was 97% (n=32/33). The negative predictive validity was 47%. The sensitivity of the tool was 76% with a corresponding specificity of 90%.

Conclusion: The DriveABLE Competence Screen was used in a routine clinical evaluation of high-risk clients referred to a driving evaluation service. It was found to be highly predictive of those who failed an on-road driving evaluation and thus is useful as a recommended case-finding tool.

What is yet unknown is the test-retest reliability of the Screen; that is, the consistency of the results when the same client is evaluated twice on the Screen. A reliability study is currently under way and the results will be presented at the Workshop.

The DriveABLE Competence Screen as a Predictor of On-road Driving



CanDRIVE
Keeping Safe Older Drivers Driving

Susan Sofer
B.Sc.(O.T.{C}), C.D.R.S.

Nicol Korner-Bitensky
B.Sc.(O.T.), M.Sc.(Rehab), Ph.D.(Rehab)

McGill

CRIR

REPAR

ACT

OBJECTIVE

This study was conducted to determine the ability of the DriveABLE Competence Screen

to predict

on-road driving outcome in clients assessed for driving competence when used in daily clinical practice.

RATIONALE

Clinicians need to:

- identify high-risk drivers
- avoid, when possible, the use of a costly and lengthy on-road test
- identify the need for intervention or training prior to on-road testing
- maximize the safety of the client, the therapist and the driving evaluator

DriveABLE Competence Screen

A. Dobbs

Six Sub-tests

Motor speed and control

Attention shifting

Complex judgment

Executive function

Attentional field

Component driving skills

DriveABLE Road Test

- About 1 hr on-road evaluation on mapped road course
- standard number of errors to be detected at various points in the route
- criterion errors, discriminating error, non-discriminating errors are pre-identified
- scores then classified by a computerized program at the DriveABLE laboratory as being either:
    - recommended pass
    - borderline pass (re-evaluate <1 year)
    - recommended driving cessation (fail)

Driving Route: each part of the route serves a specific assessment purpose

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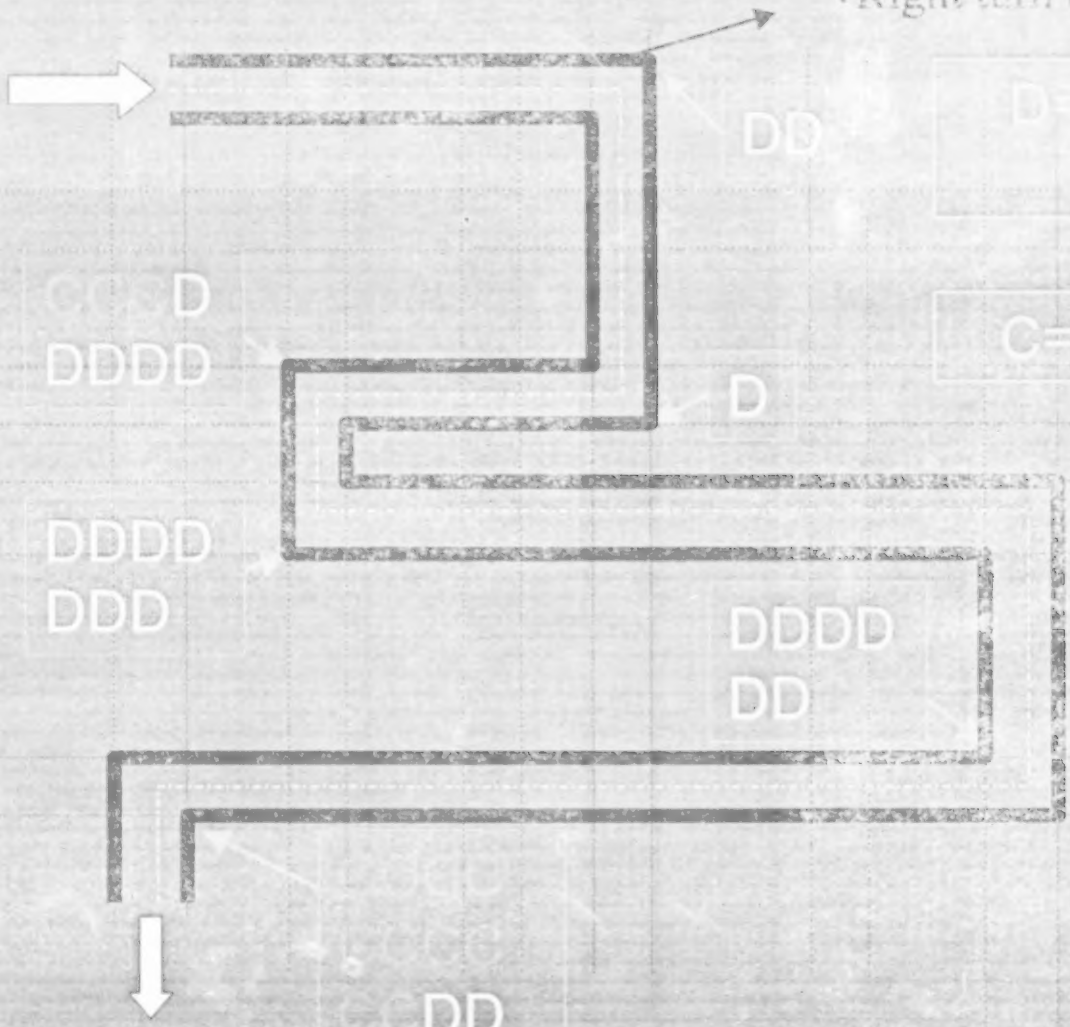


D=discriminating errors

C=criterion errors

Definition of Types of Road Test Errors

- **Criterion errors**: dangerous errors that occur only in those with cognitive decline
- **Discriminating errors**: errors that are more frequent in the elderly and those with cognitive decline
- **Non-discriminating errors**: errors that are related to "bad habits" and are performed equally by elderly, young, cognitively impaired

SUBJECTS

Subjects were clients referred to a private driving evaluation program in Montreal, Quebec, Canada from 1999 – 2002

Excluded

Medical conditions that preclude driving (hemianopsia, seizures etc.)

STUDY SAMPLE

Those who completed DriveABLE Screen and Road-Test

Those with driver's license or temporary permit

Those with ability to use dominant hand

Excluded

Trained between the time of the DriveABLE Screen and the Road Test

PROCEDURES

- ✓ Information on sociodemographic variables, Road Test scores & DriveABLE Screen were collected from the client's chart using a chart review process

- ✓ Ethics approval to review charts obtained from the Institutional Review Board, McGill University, Montreal, Quebec, Canada

DATA ANALYSIS

Analysis of variables

DriveABLE Screen:

3 possible outcomes

- Recommend cessation of driving
- Indeterminate
- No evidence of reduced competence – appears safe to drive

Road Test:

3 possible outcomes

- Fail
- Borderline pass
- Pass

Primary Question

How well would the DriveABLE Screen results predict the on-road driving performance of individuals referred for a driving evaluation?

DATA ANALYSIS

Sensitivity: the extent to which the DriveABLE Screen detects the dysfunction when it is actually present (as assessed by the gold standard- Road Test)

		Road Test: fail	Road Test: pass
Screen	fail	**a***	
	pass	**c**	

Sensitivity is calculated as:

a / a + c

* A person who failed the Screen and the Road Test would be counted in cell "**a**"

DATA ANALYSIS

Specificity: the extent to which the DriveABLE Screen rules out dysfunction when it is actually absent

		Road Test: fail	Road Test: pass
Screen	fail		**b***
	pass		**d**

Specificity is calculated as:

d / b + d

* A person who failed the Screen and passed the Road Test would be counted in cell "**b**"

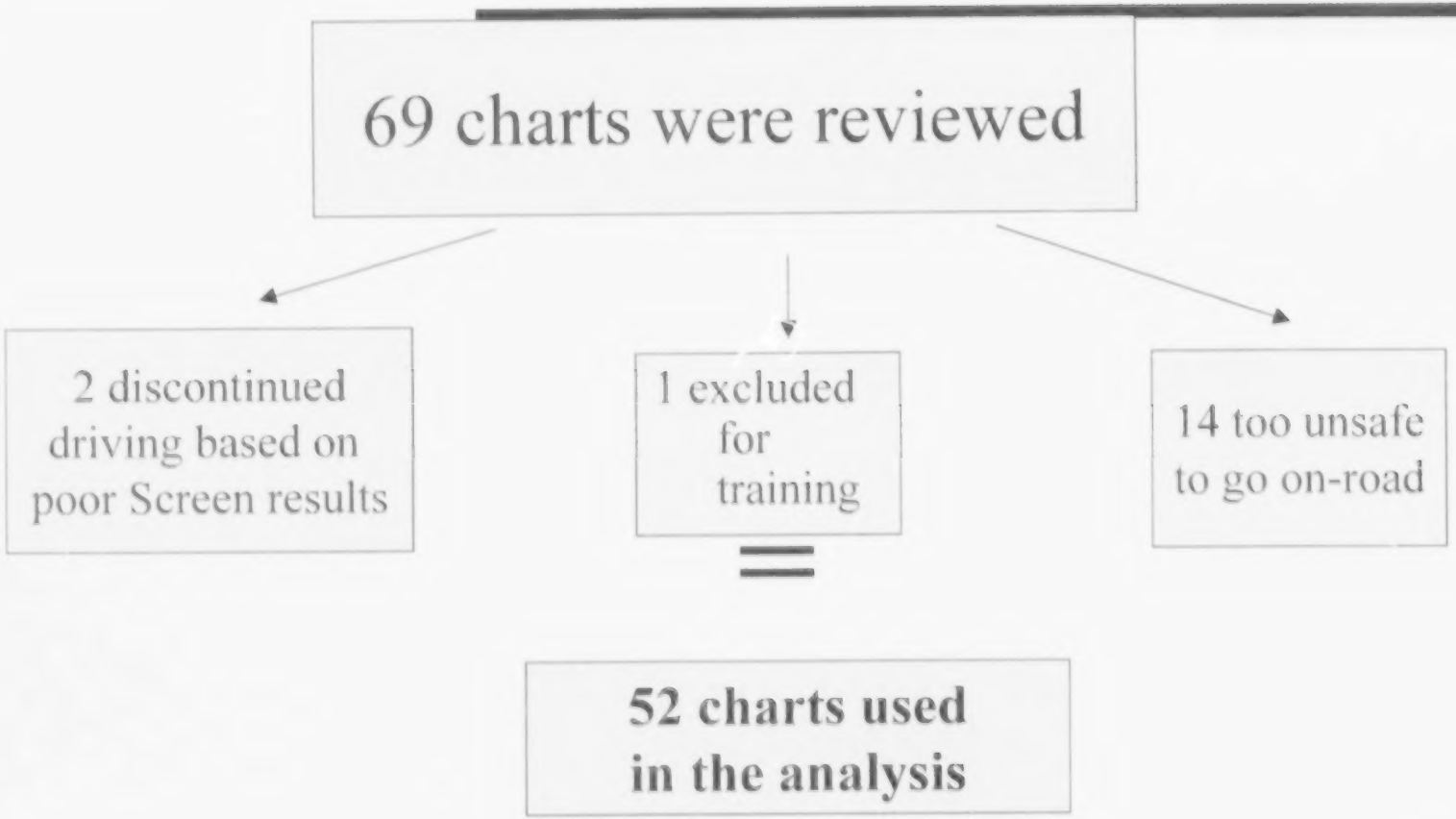
DATA ANALYSIS

Positive Predictive Value: probability that a person with a positive test (poor score on Screen) fails the road test: a / a + b

Negative Predictive Value: probability that a person with a negative test (good score on Screen) passes the road test: **d /c +d**

		Road Test: fail	Road Test: pass
Screen	fail	a	b
	pass	c	d

RESULTS


69 charts were reviewed
2 discontinued driving based on poor Screen results
1 excluded for training
14 too unsafe to go on-road
52 charts used in the analysis

Characteristics of Subjects

- Average Age: 71.6 (range 29 to 93)
- 14 females
- 38 males
- Varying referral diagnosis:
  - Cognitive decline (n=20, 38.5%)
  - Neurological conditions (n=10, 19.2%)
  - Psychological conditions (n= 4, 7.7%)
  - Others including orthopedic (n=18, 34.6%)

Classification on the Screen and Road Test (52 subjects)

		Road Test Result		
		Fail	Borderline	Pass
Screen Result	Recommend cessation	32	1	0
	Indeterminate	9	2	4
	No evidence of reduced competence	1	2	1

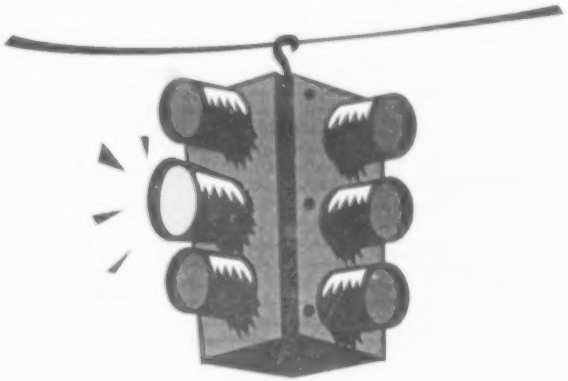
Classification on DriveABLE Screen & the Road Test

Sensitivity = (32/42, 76%)

Specificity = (9/10, 90%)

Screen	Road Test: Fail	Road Test: Borderline & Pass
Recommend cessation	32	1
Indeterminate & No reduced competence	10	9

Other Clinically Important Findings



- Failure rate = 81% (high - likely attributable to referral of those who are already seriously impaired)
- 15/52 (29%) = scored indeterminate on the Screen – this is the group recommended for on-road evaluation by the Screen

DISCUSSION

- The DriveABLE Screen identified most of those who were not fit to drive
- Clinicians may find that the DriveABLE adds valuable information on who is ready to undergo driver retraining, who is ready to drive safely and who should not yet be assessed on the road.

Where do we go from here?

- The test-retest reliability of the DriveABLE Screen is unknown and the test-retest reliability of the On-road segment is unknown and needs to be determined
- The DriveABLE was created to assess driving in those with cognitive decline but the current study indicates promise for other clientele – 9 out of 10 individuals with stroke were correctly classified by the Screen

Predictors of Driving Ability Post-Stroke: A Systematic Review

Shawn Marshall
CanDRIVE (Ottawa, Ontario)

Abstract

Background: Persons who have suffered a stroke often have persisting physical, cognitive and visuospatial impairments that may affect their ability to safely return to driving. Driving is a complex task where many physical and cognitive attributes are necessary for safe motor vehicle operation; however, the significance of specific predictors post-stroke remains unknown.

Objective: To determine the clinical predictors of successful return to driving post-stroke based on existing literature.

Method: A systematic review was conducted of the literature from 1980 to 2003 to identify prospective and retrospective studies. Preset inclusion and exclusion criteria were determined. Studies had to use at least one of the

outcome measures of crash, traffic violation, on-road driving assessment or driving simulator assessment. Two independent reviewers completed data extraction. Studies were rated for quality. All predictors of the outcomes were extracted and assembled under the headings of medical conditions, emotion and behaviour, vision, cognition, ADL/ physical function, socio-demographic and driving-related information.

Results: Eighteen studies were included. Factors that tended to be predictors of driving outcome included visual fields, visual depth perception, contrast sensitivity, neglect, construction/calculation, scanning/attention, ADL, age, driving knowledge and experience. Factors that tended not to be predictors included emotion and behaviour, memory, speech, reaction time and gender. A number of factors were found to have conflicting evidence.

Conclusion: Specific clinical factors post-stroke appear to have some predictive ability for successful return to driving. This type of information will require further study for the aim of assisting persons post-stroke to make decisions about possible return to driving.

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Predictors Of Driving Ability Post-stroke: A Systematic Review

Shawn Marshall, Frank Molnar, Malcolm Man-Son-Hing, Richard Blair, Lucie Brosseau, Hillel Finestone, Nicol Korner-Bitensky

University of Ottawa

CanDRIVE

Elizabeth Bruyere Research Institute

May 28, 2004 – 6th National Workshop for Driver Rehabilitation Specialists

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CMA guidelines following Stroke

- TIA
  - should not drive until medical assessment and investigations completed
- Symptomatic Cerebral Aneurysms-
  - Absolute barrier to driving
  - Must wait 3 months after treatment
- Stroke
  - Should not drive for 1 month
  - Where there is residual loss of motor power, a road test may be required
  - Cognition needs to be considered

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Identification and Assessment of Older Drivers with **Progressive**, Cognitive Impairment- Dementia

Driver with early cognitive impairment

Cognitive impairment noted by FP

Driver Reported to MTO

Driver undergoes Formal Driving Assessment

Driver Passes Assessment

Long Term Monitoring of Driving

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Identification and Assessment Drivers With an Acquired Brain Injury (non-progressive)

Driver with acute mild, moderate or severe brain injury

Motor, cognitive, behavioral, visuo-perceptual deficits noted by Specialist/ team (Neurosurgeon, Physiatrist)

Driver reported or not reported to MTO
-may require evaluation/ unsafe

Patient through rehabilitation process/ recovery

Determination of fitness to proceed with driving evaluation versus need for evaluation

Pass/ fail evaluation

No re-evaluation- ? Long term follow-up

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Determination of Medical Fitness to Drive: Post-Stroke

- Physical Concerns
- Medical Concerns
- Cognitive Concerns
- Behavioral Concerns

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Physical Concerns

- Vision
  - Acuity, dynamic visual acuity,diplopia, visual field defects, visual perception
- Physical mobility impairment
  - severe spasiticity, paralysis
  - Motor Coordination
- Sensory Deficits

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Medical Concerns

- Seizure Disorders
- Pre-existing medical conditions
  - Cardiac disease
  - psychiatric disorders
- Polypharmacy or psychoactive medications
  - narcotics, sedatives
- Substance abuse

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Cognitive Concerns

- Poor attention/ scanning
- Visuospatial deficits
- Slowed information processing
- Memory
- Orientation

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Behavioral Concerns

- Insight
- Judgment
- Impulsivity
- Aggression / Anger
- Risk Taking

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Predicting Who is fit to drive

- Physician/ Team Observation
- Neuropsychological Testing
- Driving Simulators
- Off-road and on-road driving evaluations

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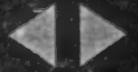
On-Road Driving Assessments

- On-road evaluations are the gold standard for assessment to date
- However
  - no standards for driving evaluations
  - no normative data
  - no guidelines for interpretation of results
  - No/ poor follow up of results
- Example- young drivers have highest crash rates



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Driving Post Stroke

- Of 290 stroke survivors 30% resumed driving (Alabama) Fisk et al 1997
  - 48% never had information about driving
  - 87% did not have a driving evaluation
  - 30% of stroke drivers had high exposure (100-200 miles/ week)

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Introduction

- Assessing Medical Fitness to Drive Post-stroke
  - Occupational Therapy Assessment
  - Typically includes "in-house" and "on-road" evaluation components
    - Gold standard
    - Cost to patient
    - Inconsistency in programs
    - Approach does not cover all constructs of driving
    - Risk to driver and evaluators
    - Who should be referred to these programs?

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Introduction

- What are the best predictors of driving ability post-stroke?
  - Need to evaluate using a model to determine which tests/ screening tools best evaluate constructs important to driving
  - Multiple studies have looked at predictors
  - Consistency among driving evaluations
  - Identify factors that need to be further studied
  - Is there objective information that can help with decision to report or not to report for physicians
  - Avoid cost (time and money) of further assessment

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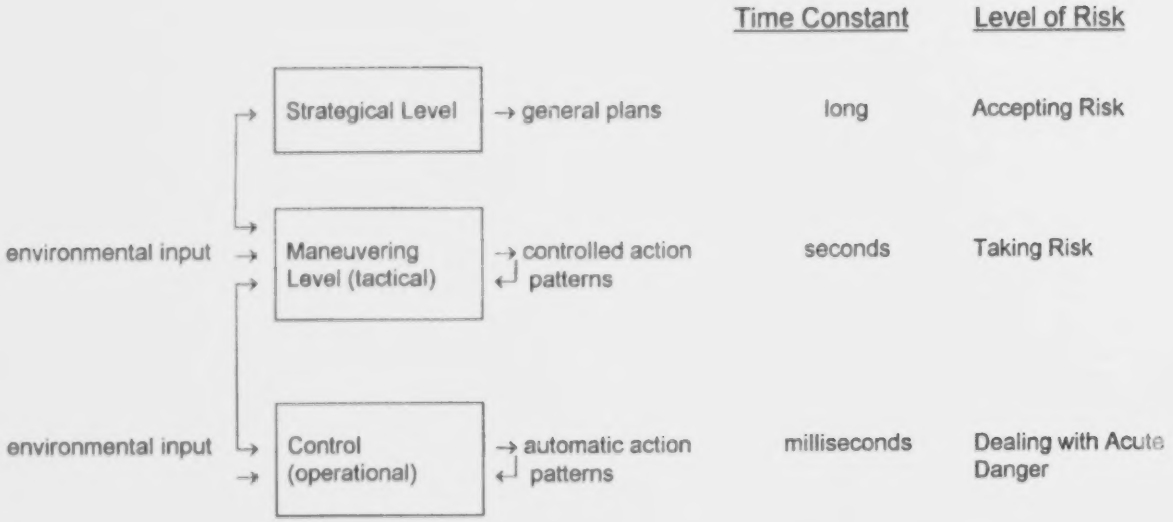
Hierarchical Model of Driving

Factors Involved in Driving

Hierarchical Control Levels in Driving



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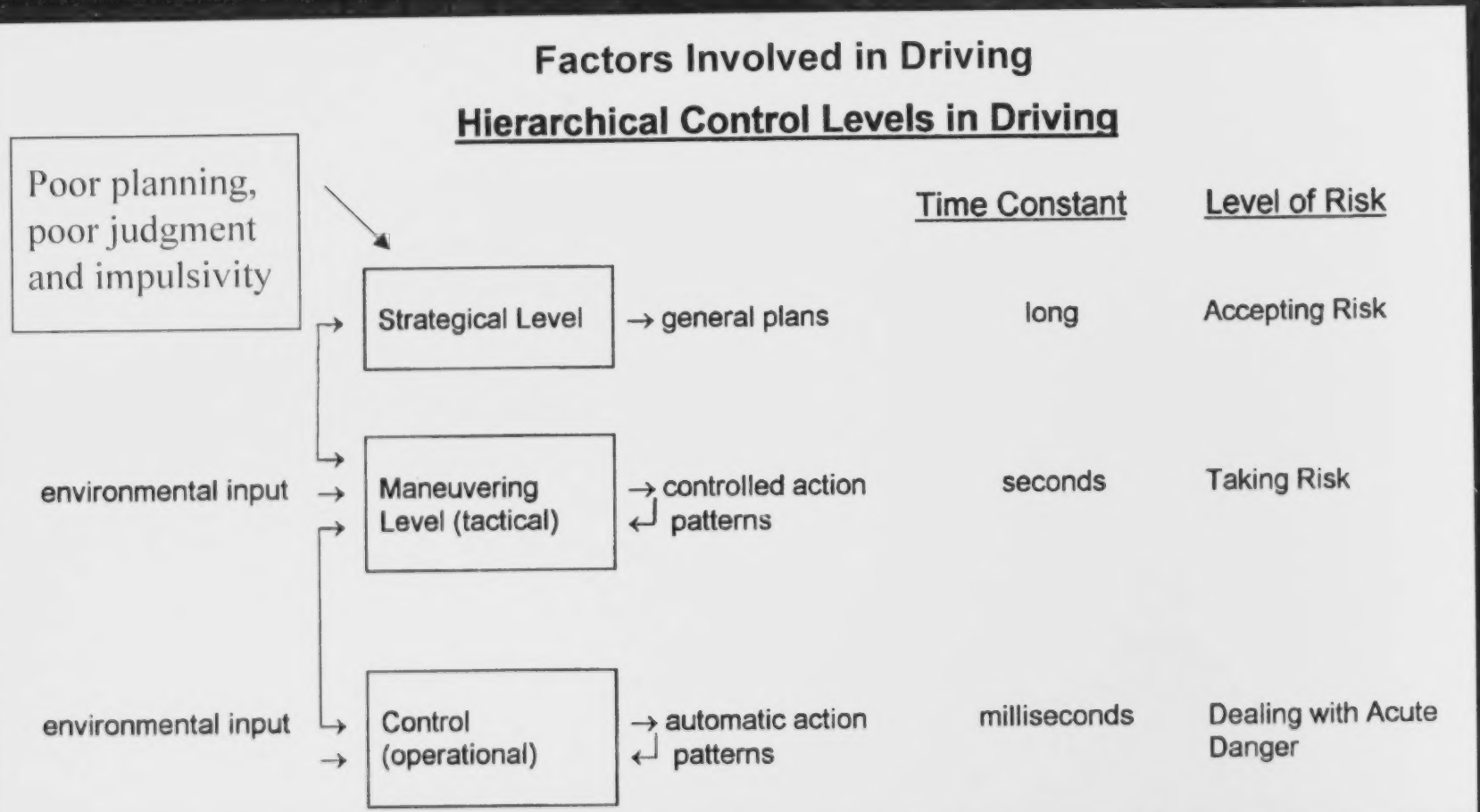
Hierarchical Model of Driving



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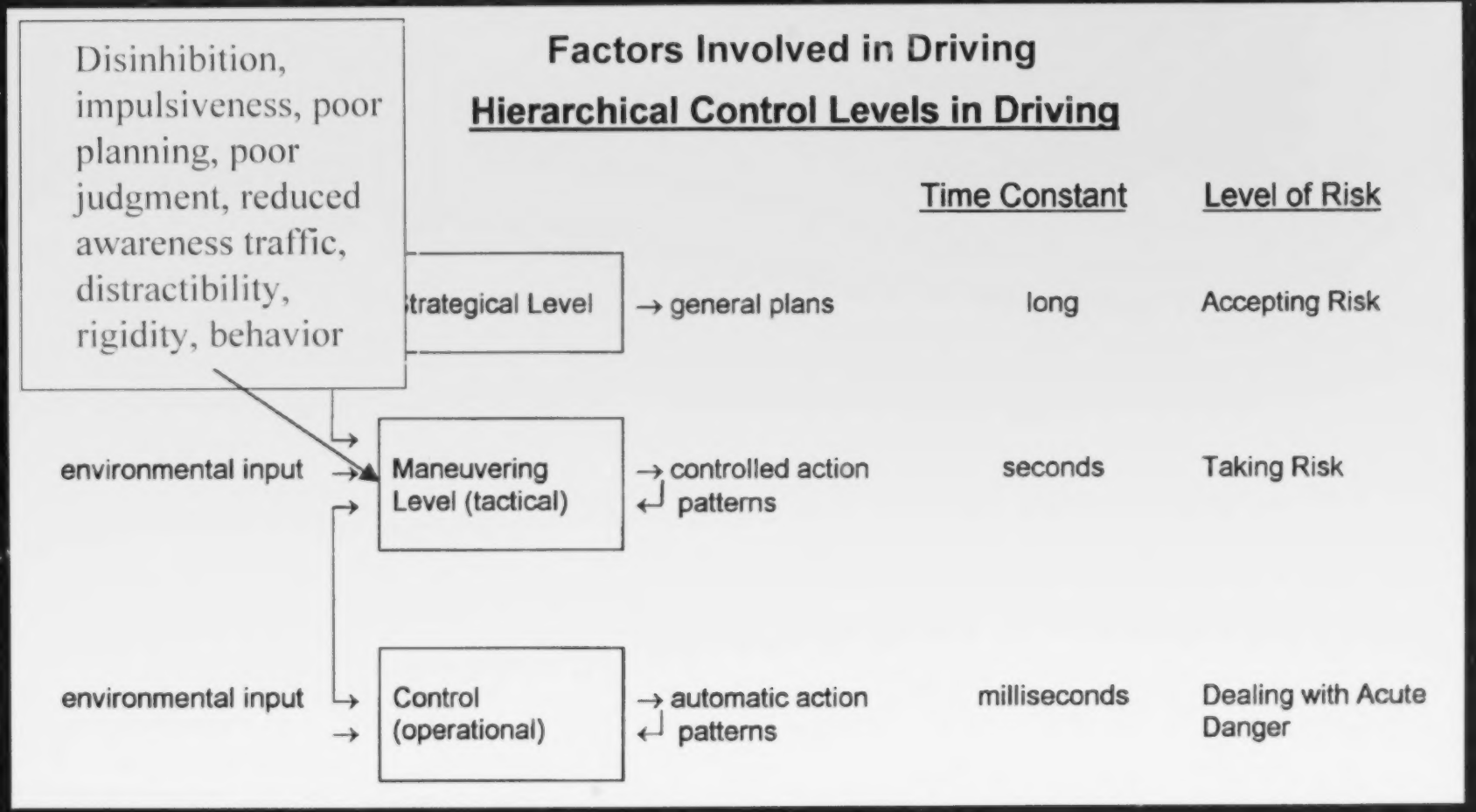
Hierarchical Model of Driving



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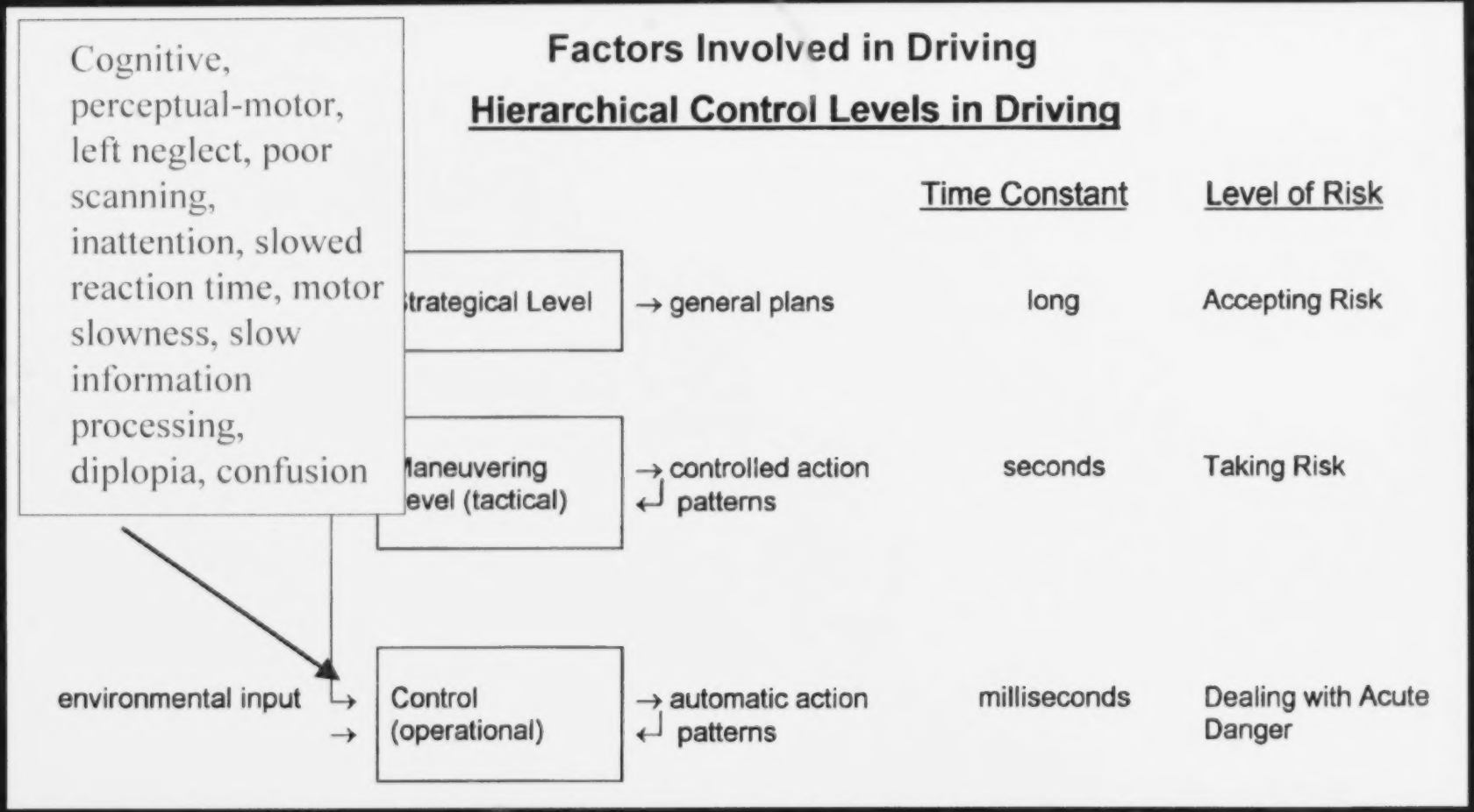
Hierarchical Model of Driving



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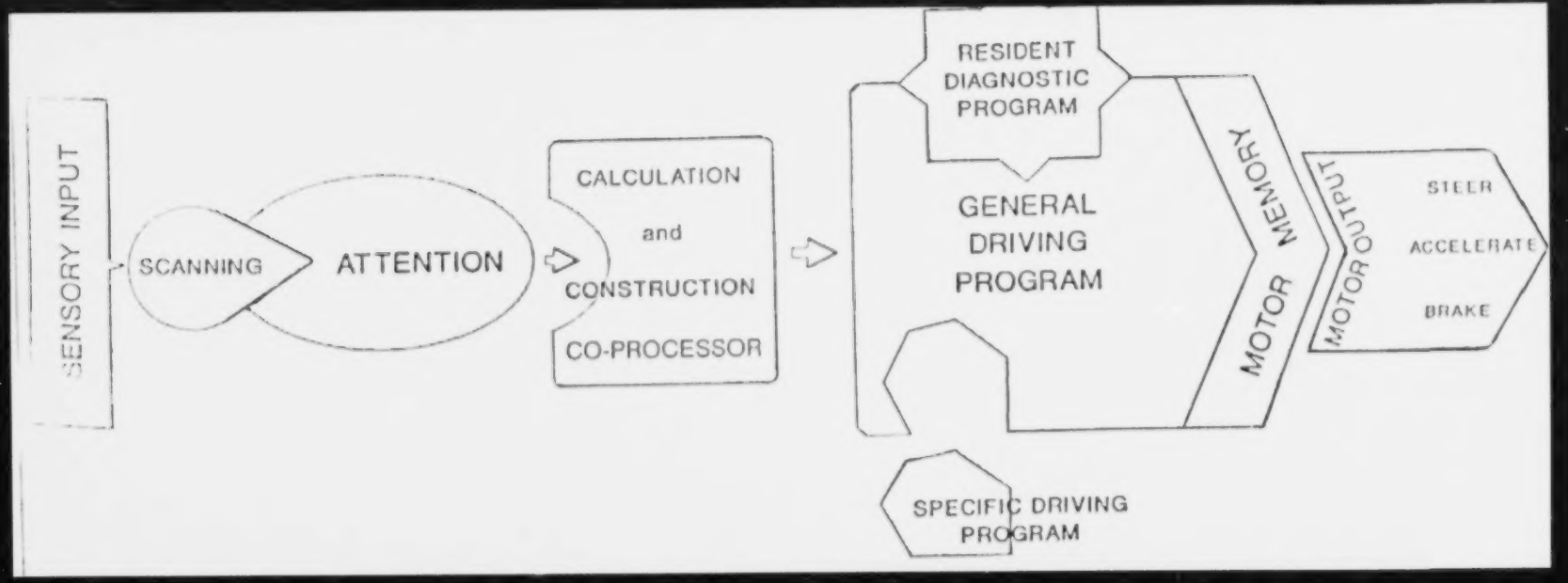
Cybernetic Model of Driving



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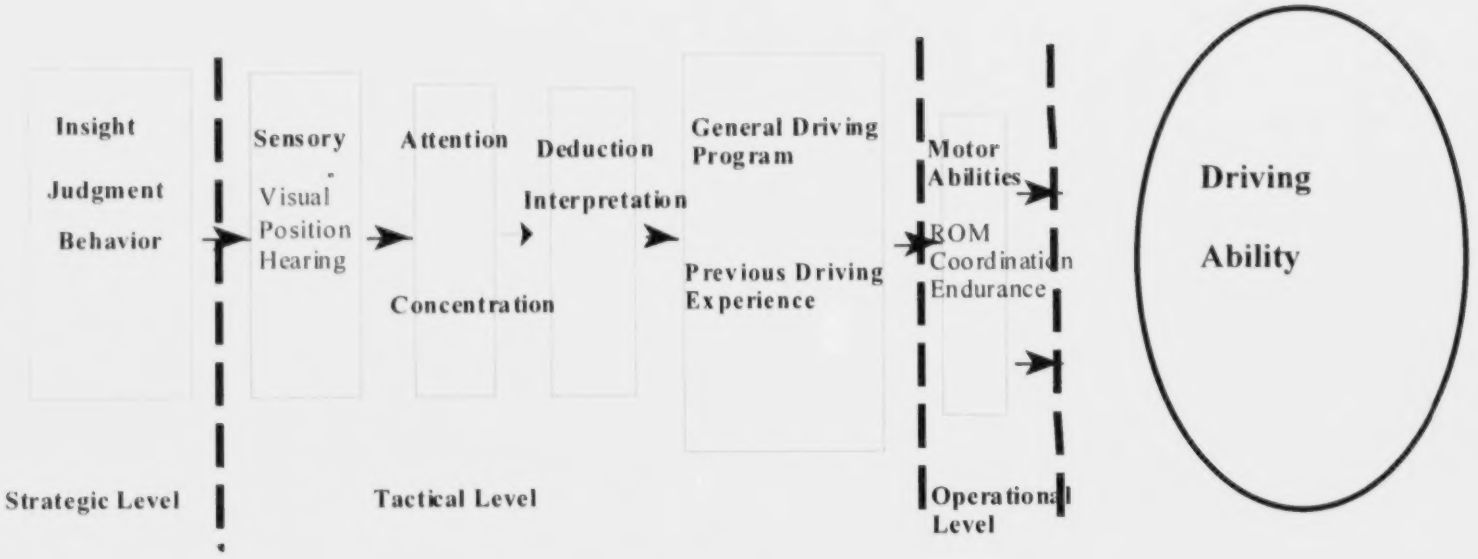
Conceptual Model of Driving



Driving Behavior and Functional Abilities

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Objectives

- To identify the most consistent predictors of driving ability post-stroke in relation to a conceptual model of driving

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Method

- Types of Studies
  - RCT's, Prospective cohort, retrospective cohort, case-control studies
- Participants
  - Stroke survivors (>50% study population)
  - Greater than 5 subjects per study
  - General license class
- Type of Intervention
  - N/A

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Method

- Type of Outcome
  - Pass or Fail outcome
    - Crash
    - Driving Conviction
    - On-road Evaluation
    - Driving Simulator Evaluation
    - Voluntary Driving Cessation
- Search Strategy
  - 1966- November 2003 (Completed by Librarian)
    - Medline, Embase, Ageline, CINAHL, Current Contents, AARP, Psychinfo, Sociofile

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Method

- Study Selection:
  - 2 Reviewers independently selected studies
  - Data extraction by 2 reviewers
  - Methodologic quality assessment 2 reviewers
    - Newcastle-Ottawa Quality Assessment Scale: Cohort Studies
- Data extracted
  - Predictors of driving outcome and associated significance level

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Results

- Literature Search Results: 816 studies
- 714 eliminated based on abstract/ title
- 102 reviewied
- 86 did not meet inclusion criteria
- 16 studies included
- 111 study predictors identified

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Included Studies

Reference	Type of study	Country	No. participants, time since stroke, gender	Main outcome	Quality rating score	Comments
Akinwuntan and al.[1]	Cohort cross-sectional	Belgium	N:104 82 males, 22 females Onset: 18.5mo (20.0)	On-road evaluation	3, 1, 1	
Fisk, Owsley and Pulley[2]	Cohort cross-sectional	USA	N: 290 160 males, 30 females Onset: 2.9 yrs (1.4)	Self-reported driving status	3, 0, 0	
Fisk, Owsley and Mennemeier[3]	Case-control cross-sectional	USA	N: 50 Males, females: N/A Onset: at least 6mo	Driving cessation	3, 2, 0	
Galski, Ehle and Bruno[4]	Cohort retrospective	USA	N: 37 27 males, 10 females Onset: N/A	On-road evaluation	3, 0, 1	Subjects partly THI (14 subjects out of 37)
Golper, Rau and Marshall[5]	Cohort cross-sectional	USA	N: 20 17 males, 3 females Onset: 50.6mo	Driving cessation	3, 0, 0	

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Included Studies

Reference	Type of study	Country	No. participants, time since stroke, gender	Main outcome	Quality rating score	Comments
Klavora and al.[6]	Clinical trial	Canada	N: 10 8 males, 2 females Onset: 9.8months	On-road evaluation	3, 0, 3	
Klavora, Heslegrave and Young[7]	Cohort cross-sectional	Canada	N: 56 46 males, 10 females Onset: at least 6mo	On-road evaluation	4, 2, 1	
Korner-Bitensky and al.[8]	Cohort cross-sectional	Canada and USA	N: 269 215 males, 54 females Onset: 6.9mo (11.0)	On-road evaluation	3, 1, 1	
Kumar and al.[9]	Clinical trial	USA	N: 16 All males Onset: 6.2mo	Driving status	4, 0, 1	
Lee and al.[10]	Cohort prospective	USA	N: 110 69 males, 41 females; Onset: N/A	Driving status	3, 0, 2	
Legh-Smith, Wade and Langton-Hewer[11]	Cohort cross-sectional	UK	N: 144 129 males, 15 females Onset : about 1yr	Driving status	3, 0, 0	

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Included Studies

Reference	Type of study	Country	No. participants, time since stroke, gender	Main outcome	Quality rating score	Comments
Lundberg and al.[12]	Cohort cross-sectional	Sweden and Norway	N: 97 87 males, 10 females Onset: 1.1yrs (1.45)	On-road evaluation	4, 1, 1	
Mazer, Korner-Bitensky and Sofer[13]	Cohort cross-sectional	Canada	N: 84 63 males, 21 females Onset: 10.4mo (15.8)	On-road evaluation	3, 1, 1	
Nouri, Tinson and Lincoln[14]	Cohort Cross-sectional	Great Britain	N: 39 36 males, 3 females Onset: between 6wks and 4yrs	On-road evaluation	4, 0, 1	
Schanke and Sundet[15]	Cohort cross-sectional	UK	N: 55 42 males, 13 females Onset : 27.6mo (47.9)	On-road evaluation	4, 1, 1	

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Study Quality

Authors	Selection	Comparability	Outcome
Akinwuntan and al.[1]	★★★	★	★
Fisk, Owsley and Pulley[2]	★★★		
Fisk, Owsley and Mennemeier[3]	★★★	★★	
Galski, Ehle and Bruno[4]	★★★		★
Golper, Rau and Marshall[5]	★★★		
Klavora and al.[6]	★★★		★★★
Klavora, Heslegrave and Young[7]	★★★★	★★	★
Korner-Bitensky and al.[8]	★★★	★	★
Kumar and al.[9]	★★★★		★
Lee and al.[10]	★★★		★★
Legh-Smith, Wade and Langton-Hewer[11]	★★★		
Lundberg and al.[12]	★★★★	★	★
Mazer and al.[13]	★★★★	★★	★★★
Mazer, Korner-Bitensky and Sofer[14]	★★★	★	★
Nouri, Tinson and Lincoln[15]	★★★★		★
Schanke and Sundet[16]	★★★★	★	★

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NEWCASTLE - OTTAWA QUALITY ASSESSMENT SCALE
COHORT STUDIES

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Note: A study can be awarded a maximum of one star for each numbered item within the Selection and Outcome categories. A maximum of two stars can be given for Comparability

Selection

1) Representativeness of the exposed cohort
   a) truly representative of the average _____ (describe) in the community ✸
   b) somewhat representative of the average _____ in the community ✸
   c) selected group of users eg nurses, volunteers
   d) no description of the derivation of the cohort

2) Selection of the non exposed cohort
   a) drawn from the same community as the exposed cohort ✸
   b) drawn from a different source
   c) no description of the derivation of the non exposed cohort

3) Ascertainment of exposure
   a) secure record (eg surgical records) ✸
   b) structured interview ✸
   c) written self report
   d) no description

4) Demonstration that outcome of interest was not present at start of study
   a) yes ✸
   b) no

Comparability

1) Comparability of cohorts on the basis of the design or analysis
   a) study controls for _____ (select the most important factor) ✸
   b) study controls for any additional factor ✸ (This criteria could be modified to indicate specific control for a second important factor.)

Outcome

1) Assessment of outcome
   a) independent blind assessment ✸
   b) record linkage ✸
   c) self report
   d) no description

2) Was follow-up long enough for outcomes to occur
   a) yes (select an adequate follow up period for outcome of interest) ✸
   b) no

3) Adequacy of follow up of cohorts
   a) complete follow up - all subjects accounted for ✸
   b) subjects lost to follow up unlikely to introduce bias - small number lost - > ____ % (select an adequate %) follow up, or description provided of those lost) ✸
   c) follow up rate < ____ % (select an adequate %) and no description of those lost
   d) no statement

Table 1. Sensory function

PREDICTORS	ON-ROAD	DRIVING CESSATION
⌘ Visual field		
Visual field	p<.01[1], p n.s.[15], p=.118[16]	
Visual field median reaction time	**p<.05[1]**	
Visual field absolute (reaction time / omissions)	p<.01[1] / p n.s.[1]	
Peripheral vision	(R) p=.07[4], (L) p=.74[4]	p=.32[3], p<.01[5]
visual acuity	p<.001[1], p n.s.[15]	p=.478[3]
⌘ Visual depth perception		
Depth Perception	p<.05[1], p n.s.[15], p=.61[4]	p<.01[5]

Table 2. Cognition

PREDICTORS	ON-ROAD	DRIVING CESSATION
⌘ Attention and memory tests		
Trail making test A (time)	**p=.05[14] [no of errors p=.15[14]], p=.002[16]**	**p<.01[9]**
Trail making test B (time)	**p=.003[14] [no errors p=.0002[14]], p=.001[16]**	**p n.s.[9]**
WAIS digit span	p=.41[4], p=.429[16]	
Serial digit modalities test (oral)	**p=.001[16]**	
Rey-Osterreith Complex Figure Test - Units copy	**p n.s.[15], p<.001[1] [units recall p<.01[15]]**	
FIM cognitive subscore		**p<.002[2]**
UFOV cut off reduction 40%	**p<.001[1]**	**p=.001[3]**

Table 2. Cognition

PREDICTORS	ON-ROAD	DRIVING CESSATION
⌘ Perceptual tests		
Trail making test A (time)	**p=.05[14] [no of errors p=.15[14]], p=.002[16]**	**p<.01[9]**
Trail making test B (time)	**p=.003[14] [no errors p=.0002[14]], p=.001[16]**	**p n.s.[9]**
WAIS picture completion	**p=.026[16]**	
Single letter cancellation (# errors / time)	**p=.05[14] / p=.03[14]**	
Bourdon dot cancellation (time)	**p<.05[12], p<.01[15] [misses p<.01[15], false alarms p n.s.[15]]**	
UFOV cut off reduction 40%	**p<.001[1]**	**p=.001[3]**
Cube copy	**p<.001[15]**	
Copy a cross (3D)	**p=.013[16]**	
Rey-Osterreith Complex Figure Test - Units copy	**p n.s.[15], p<.001[1] [units recall p<.01[15]]**	
WAIS-R Block Design Test (score)	**p=1.0[4], p=.001[16]**	**p<.001[9]**
Color vision		**p<.05[5]**
Spatial relationship		**p<.01[5]**
Contrast sensitivity - Pelli-Robson chart		**p=.001[3]**
Visual neglect absolute difference (reaction time / omissions)	**p<.001[1] / p<.05[1]**	
Anosognosia awareness index	**p=.001[16]**	
Behavioral Inattention test		**p=.004[3]**
Flexibility (reaction time / error)	p n.s.[1] / p<.05[1]	
Scanning (reaction time / omission)	**p<.001[1] / p<.01[1]**	
Incompatibility (reaction time / error)	**p<.05[1] / p<.05[1]**	
Kinetic Vision	**p<.01[1]**	
Dynavision (hits)	**p?.05[6]**	
Dynavision Performance Assessment Battery Task	Complex p=.5769[7], Endurance p=.003[7], Simplest p=.5496[7], Difficult p=.8493[7]	

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⌘ Executive and Thinking Functions		
Raven's IQ		**p<.001[11]**
Trail making test A (time)	**p=.05[14] [no of errors p=.15[14]], p=.002[16]**	**p<.01[9]**
Trail making test B (time)	**p=.003[14] [no errors p=.0002[14]], p=.001[16]**	**p n.s.[9]**
Rey-Osterreith Complex Figure Test - Units copy	**p n.s.[15], p<.001[1] [units recall p<.01[15]]**	
FIM cognitive subscore		**p<.002[2]**
Incompatibility (reaction time / error)	**p<.05[1] / p<.05[1]**	
⌘ Verbal Functions		
Porch Index of Communicative Ability		**p<.01[5]**
FIM cognitive subscore		**p<.002[2]**
Gestural expression		**p<.01[5]**
Auditory comprehension		**p<.01[5]**
Reading		**p<.01[5]**
Verbal expression		**p<.01[5]**
Aphasia	**p<.01[1]**	
⌘ Orientation and Attention		
Right and left distinction		**p<.01[5]**

⌘ Other		
Bells (# errors / time)	p=.14[14] / p=.08[14]	
Charron (# errors / time)	p=.056[13], p=.19[14] / p=.003[14]	
Double cancellation	p=.07[13]	
Visual attention (simple / complexe stimuli)	p=.521[16] / p=.605[16]	
Divided attention (correct response / median visual reaction time)	p<.001[1] / p n.s.[1]	
Body image		**p<.01[5]**
Figure-ground test	p=.51[4]	p<.01[5]
Hooper Visual organization test	p=.28[4]	
Choice visual reaction time (msec)	p?.10[6]	
Choice response time (msec)	p?.10[6]	
Motor Free Visual Perception Test (Score)	**p=.609[8], p=.005[14] [time p=.01[14]], p=.07[13] [time p=.004[13]],**	
Face Recognition Test	p n.s.[15]	
Picture interpretation test	p=1.0[4]	
Inductive reasoning test	p=1.0[4]	
Stroop test	p=.382[16]	
Raven's IQ		**p<.001[11]**
Hodkinson Mental Test		p n.s.[11]
Predriver evaluation outcome	p=.21[4]	
Overall intelligence summary scores (verbal and nonverbal)	*p n.s.[8]	
Cognitive Behavioral Driver's Inventory	p=.0531[7]	
What's in the square	p n.s.[15]	
What else is in the square	**p<.001[15]**	
Benton Visual Retention Test (correct)	p=1.0[4]	
Road map (# errors / time)	p=.06[14] / p=.007[14]	
WAIS verbal function similarities	p=.077[16]	
Token Test	p n.s.[15]	

* Crashes as the outcome

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Cognition Predictors

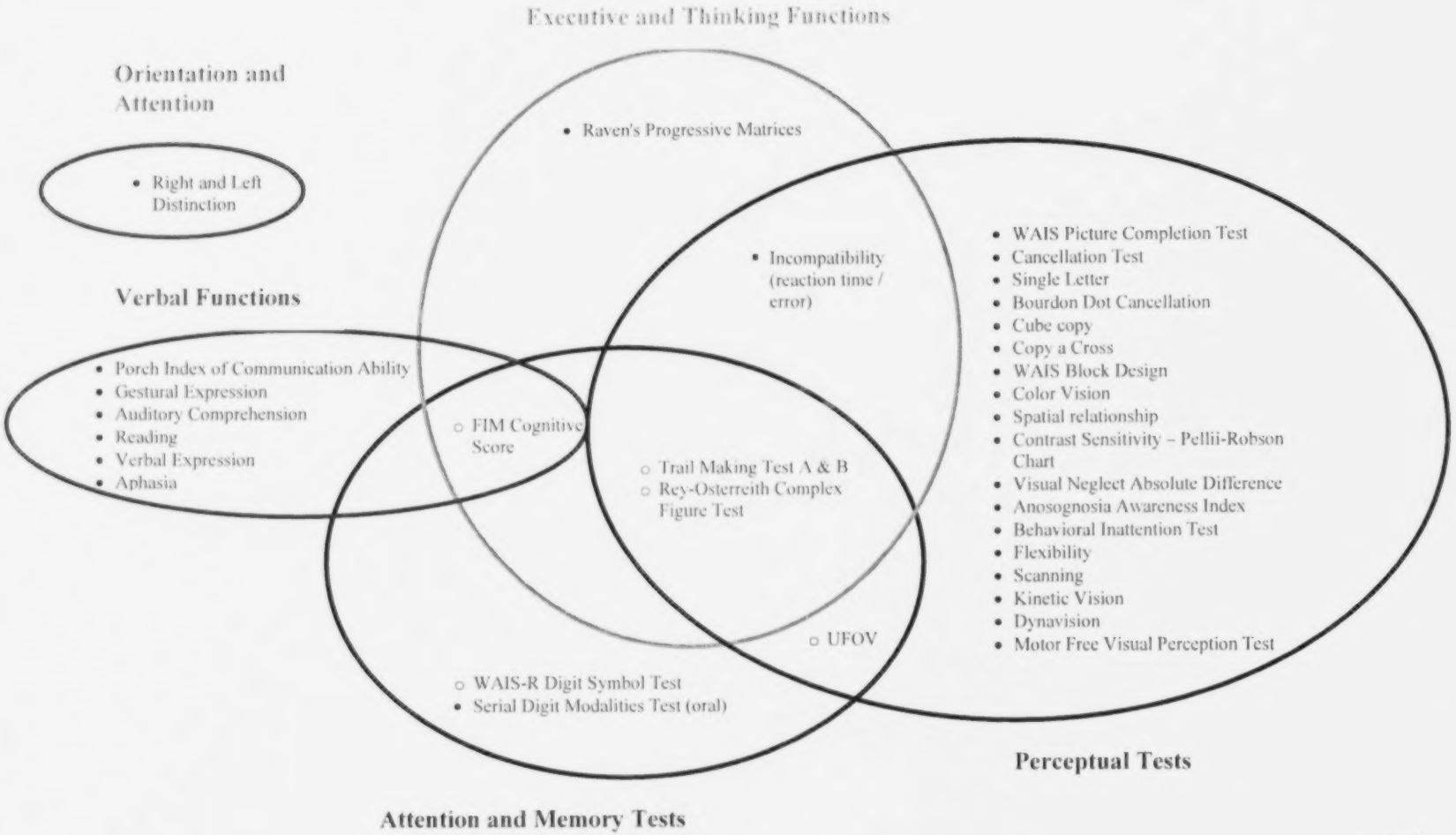

Table 3. Co-morbidity

PREDICTORS	ON-ROAD	DRIVING CESSATION
NIHSS (on admission)		p=.236[10]
Medical concerns		**p<.01[5]**
Epilepsy	p n.s.[1]	
Time since stroke	p=.249[13]	
Disease severity (moderate / severe)	p=.017[13] / p=.106[13]	

Table 4. Socio-demographic factors

PREDICTORS	ON-ROAD	DRIVING CESSATION
Age	**p<.001[1], p=.4322[7], p<.0001[12], p=.08[16], p=.08[13]**	**p=.0006[2], p=.028[10]**
Race		p=.1972[2]
Gender	p n.s.[1], p=.464[7], p=.754[13]	p=.5962[2], p=.425[10]
Marital status		**p=.004[10]**
Side of lesion	**p<.05[1]**	

Table 5. Driving-related information

PREDICTORS	ON-ROAD	DRIVING CESSATION
⌘ Experience		
Recency of last driving event (pre-stroke)		**p=.001**[10]
Driving frequency (pre-stroke)		**p=.02**[10]
Driving experience (years)	**p<.01**[1]	
Believed would drive again (on admission)		p=.123[10]
⌘ Knowledge		
Road sign recognition	**p<.0001**[12], **p<.01**[15]	
Hazard recognition	**p<.01**[15]	

Table 6. Motor function

PREDICTORS	ON-ROAD	DRIVING CESSATION
⌘ ADL		
Barthel		**p=.001[10], p<.001[11]**
FIM	**p=.061[13]**	**p<.0001[2]**
SF-12 PCS (pre-stroke)		**p=.007[10]**
SF-12 MCS (pre-stroke)		p=.562[10]
⌘ Reaction time		
Reaction time	**p=.77[4], p=.003[16], p=.004-.014[13]**	**p<.01[5]**
Choice reaction (errors / reaction time / coefficiant of variance)	p= n.s.[15] / p<.001[15]/ p n.s.[15]	
⌘ Motor		
Motor functioning		**p<.01[5]**
Arm function score		**p<.01[11]**
Grooved Pegboard	p=.121[16]	
⌘ Coordination / balance		
Pursuit rotor (10rpm / 15rpm)	p n.s.[15] / p<.01[15]	
Motor sequencing	p n.s.[15]	p<.01[5]

Table 7. Emotions & Behaviours

PREDICTORS	ON-ROAD	DRIVING CESSATION
General emotional factors		**p<.01**[5]
Social support		**p=.013**[10]
Wakefield depression inventory		**p<.001**[11]
Inattention	p=.12[4]	
Confusion	p=.18[4]	
Slowness	p=.35[4]	
Distractibility	p=.48[4]	
Anxiety	p=.60[4]	
Hostility	p=.74[4]	
!mpulsivity	p=1.0[4]	

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SUMMARY

PREDICTORS	ON-ROAD	DRIVING CESSATION
⌘ Visual field		
Visual field	+	+
visual acuity	+	-
⌘ Visual depth perception		
Depth Perception	+/-	+
Cognition		
Trail making test A (time)		
Trail making test B (time)		
Rey-Osterreith Complex Figure Test - Units copy		
FIM cognitive subscore		
UFOV cut off reduction 40%		
Incompatibility (reaction time / error)		
Motor Free Visual Perception Test		
⌘ Attention and memory tests		
	+	+
⌘ Perceptual tests		
	+	+
⌘ Executive and Thinking Functions		
Incompatibility (reaction time / error)	+	+
⌘ Verbal Functions		
Aphasia	+	+
⌘ Orientation and Attention		
Right and left distinction	N/A	+

Table 3. Co-morbidity

Disease severity (moderate / severe)	-	+

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Exit

Table 4. Socio-demographic factors

PREDICTORS	ON-ROAD	DRIVING CESSATION
Age	+	+
Marital status	-	+
Side of lesion	+	-

Table 5. Driving-related information

⌘ Experience		
Recency of last driving event (pre-stroke)	-	+
Driving frequency (pre-stroke)	-	+
Driving experience (years)	+	-
⌘ Knowledge		
Road sign recognition	+	**N/A**
Hazard recognition	+	**N/A**

Table 6. Motor function

⌘ ADL		
Barthel		+
FIM	+/-	+
SF-12 PCS (pre-stroke)		+
⌘ Reaction time		
Reaction time	+	+
⌘ Motor		
Motor functioning	**N/A**	+
⌘ Coordination / balance		
	+/-	+

Table 7. Emotions & Behaviours

Depression/ Affective	N/A	+
Behavior	-	N/A

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Conclusions

- Vision, cognition, driving experience and functional ability appear to best predict driving outcome
  - Specific measures appear to have ability to discriminate consistently across studies
  - Cognition is the best studied area
- Not all domains of driving construct well studied: e.g. behaviour, functional abilities
- There are differences in predictors for On-road assessment and Voluntary Cessation

"What's the big idea sticking this on the back wall of the garage?"

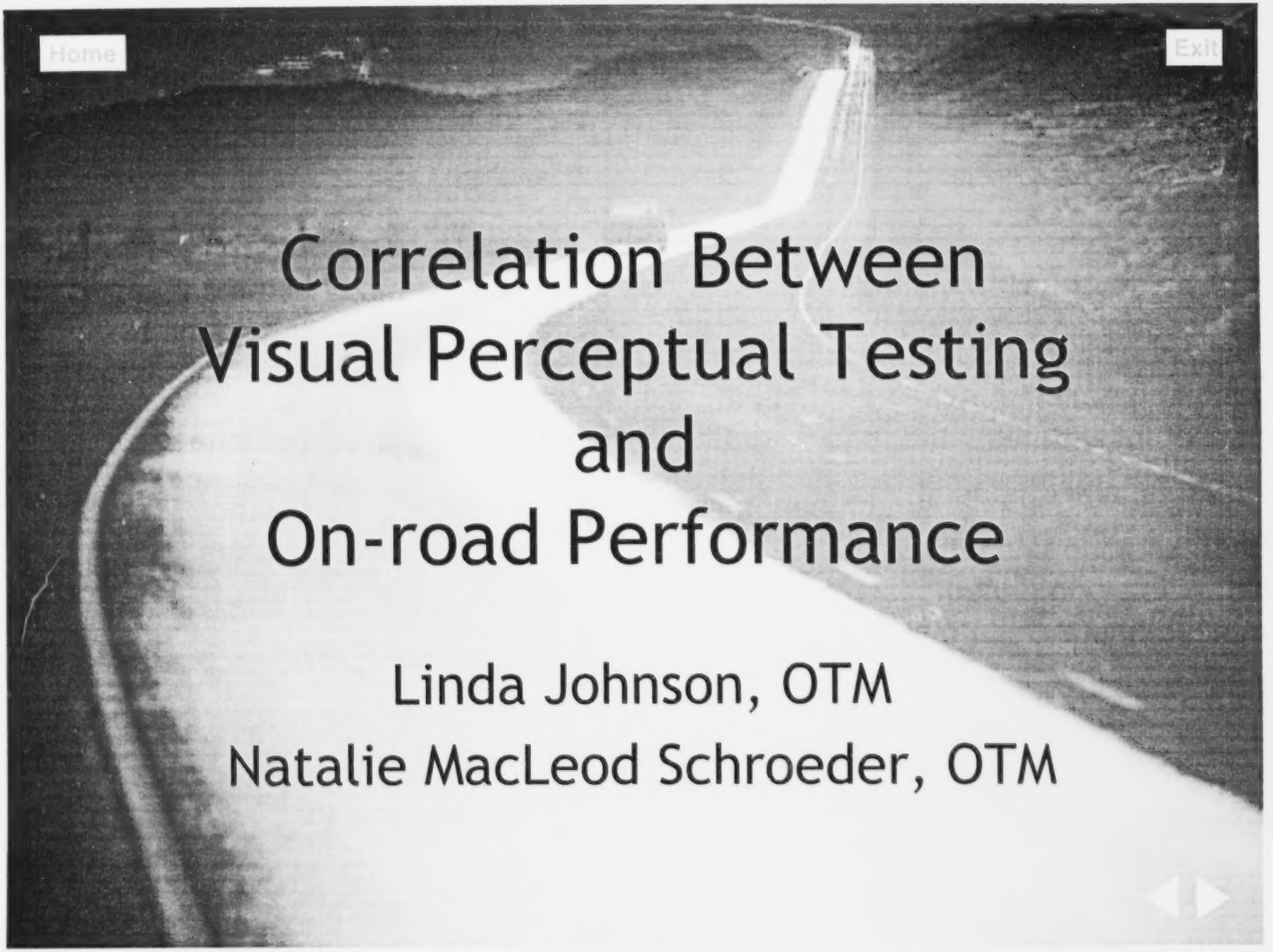
Correlation Between Visual Perceptual Testing and On-Road Performance

Linda Johnson
Winnipeg Health Sciences Centre (Winnipeg, Manitoba)

Abstract

Accurate assessment of an individual's ability to return to or begin driving following the onset of injury, illness or disability is an important issue for occupational therapists, their clients and society in general. Occupational therapists have used physical, cognitive and perceptual tests, combined with assessments of on-road driving, to determine who are suitable candidates for driving, who should receive further training, and who should have their licence revoked. A retrospective study of data compiled from drivers assessed in a disabled drivers management program 2001 through 2003 was conducted. The driving assessments of approximately 100 adults were reviewed to examine the results of perceptual testing and the outcome of the on-road component of the tests, and to determine the relationship between the results of perceptual testing and on-road performance.

Perceptual tests used included the Motor Free Visual Perceptual Test and performance on a Frostig spatial-relations worksheet. This paper presents the results of this study, specifically the relationship between perceptual tests and driving performance, and the utility of a spatial relations worksheet in aiding decision making about a driver's ability to safely resume driving. Those therapists working in driver management programs or requiring screening tools for driving performance will benefit from this presentation.



Correlation Between Visual Perceptual Testing and On-road Performance

Linda Johnson, OTM

Natalie MacLeod Schroeder, OTM

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D.A.M.P.

(Driver Assessment & Management Program)

- Occupational Therapy Department
- Health Sciences Centre, Winnipeg
- Two-part Program
  - In-department "pre-screen" physical and perceptual testing (OT)
  - On-road evaluation (OT and Driving Instructor)

  - Recommendations to D.V.L.
  - 150 assessments per year
  - many neurological

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Perceptual Testing

- Component of pre-screening
- Visual perception is important

- Not used as a "cut off"

- Seen as valuable clinically, before and after on-road assessment

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Recommendations

- Good candidate
  - optional training
- Mandatory Training: 2 – 4 Lessons
  - good or questionable potential
- Unsuitable candidate
  - poor insight
- Based on On-Road Performance

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Purpose of the Study

- Determine relationship between perceptual tests and outcome recommendations

- Examine in detail M.V.P.T. and Frostig "test"/worksheet

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Purpose of the Study
(continued)

Investigate if perceptual tests are:

- Useful in clinical decision making
- Potential for physicians to determine who needs referral (further studies)

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Motor Free Visual Perception Test

- Colarusso and Hammill (1972)
- 36 items (Not MVPT – R)
- Test items - six sections
  - based on groupings of items identified by Bouska and Kwatny Adult norms (1983)

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M.V.P.T.

- Visual discrimination
- Figure ground
- Form constancy
- Visual memory
- Visual closure
- Position in space
  - Accuracy / Time

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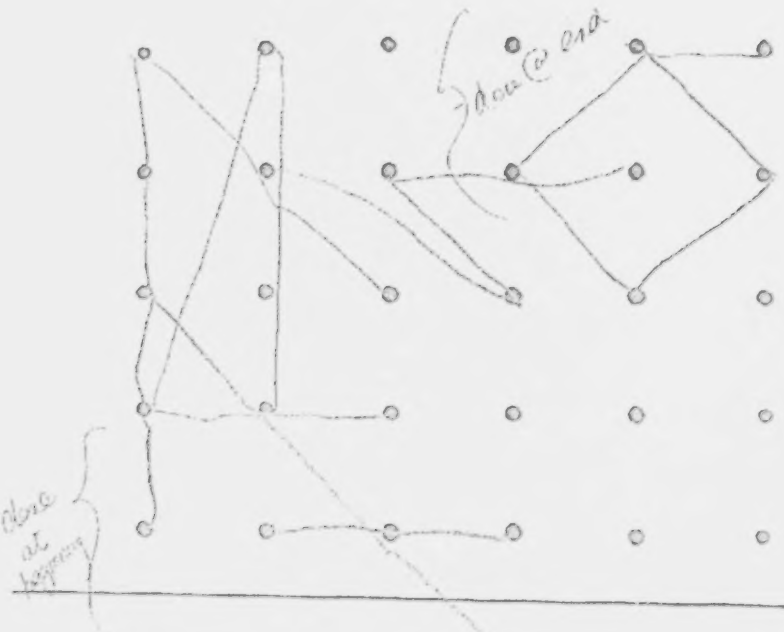
Frostig "Test"

- Based on a Frostig worksheet (Frostig, 1966)
- Examines Spatial Relations
- No standardization or validity testing
- Clinical observation only

Exit

Home

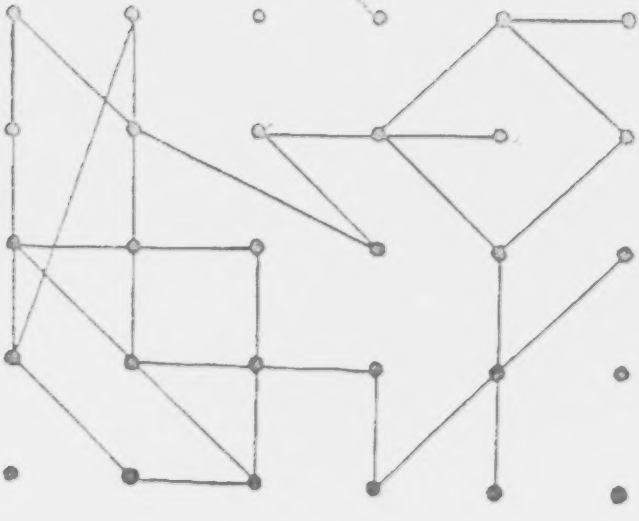
SPATIAL RELATIONS



started with many errors - -

then proceeded more accurately

suggested to try again



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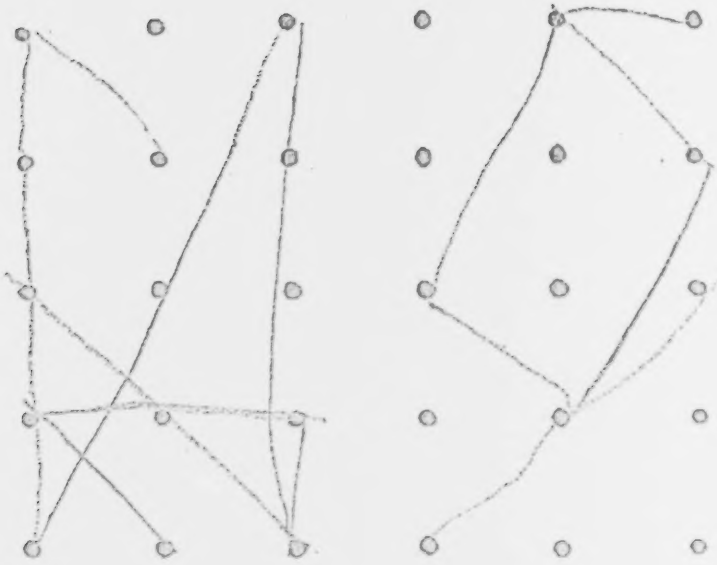
Stopped

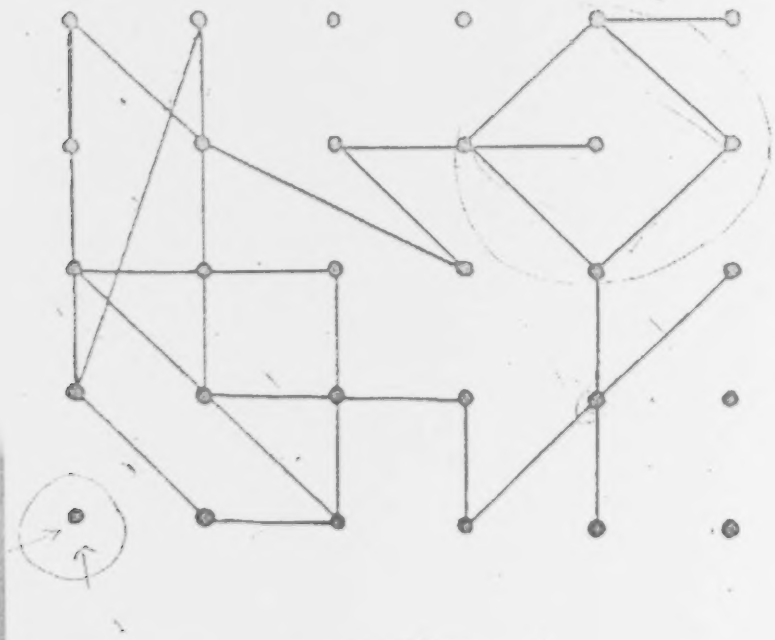
try again

SPATIAL RELATIONS



++ spatial relations deficit

distorted size shape etc.

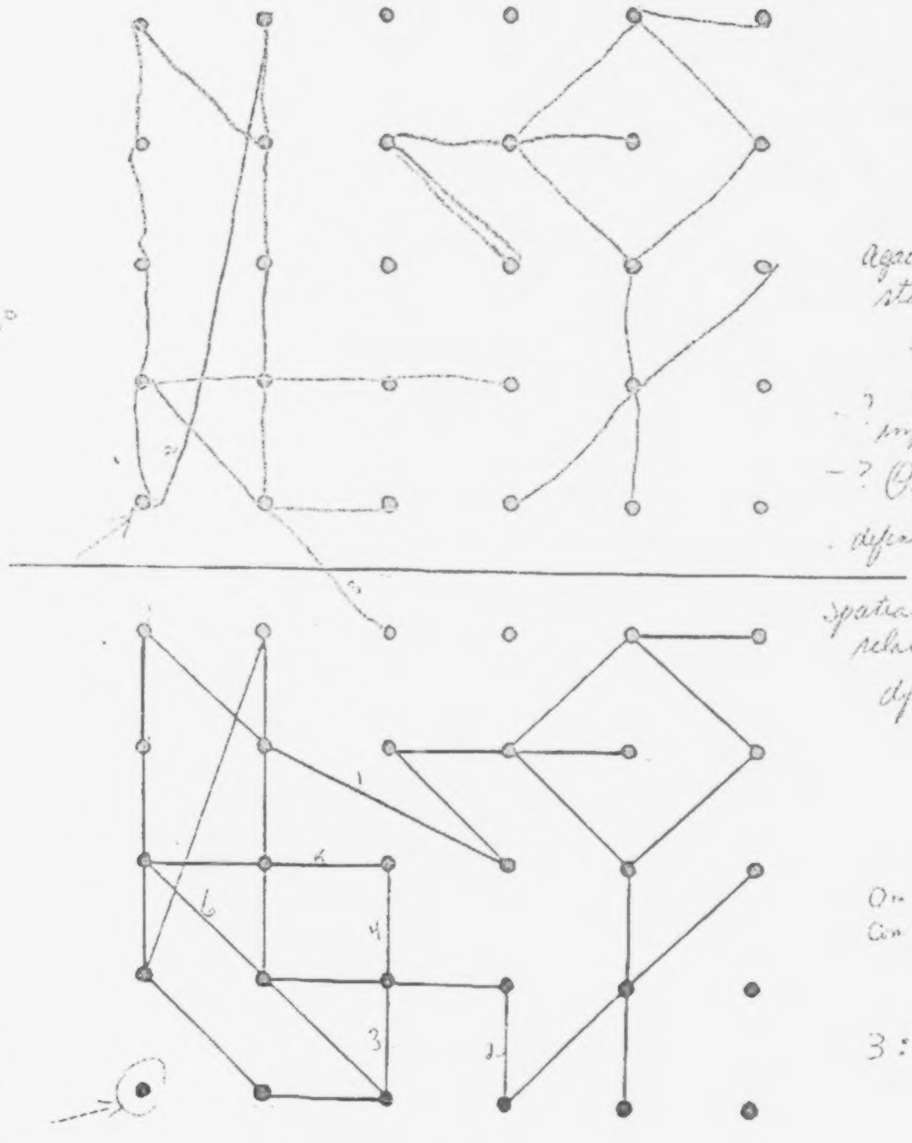


+ @ right

2:17

3:38

<u>SPATIAL RELATIONS</u>



again started wrong

-? impulsive

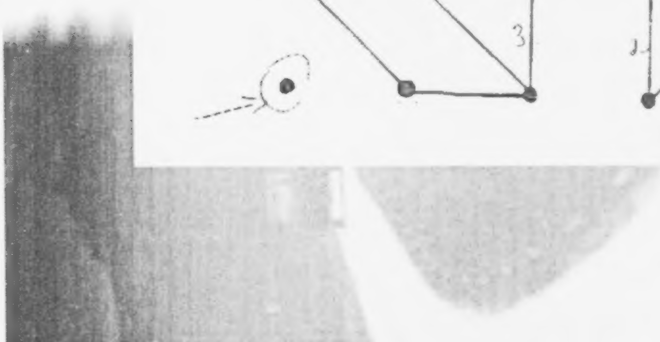
-? neglect?

definitely ...

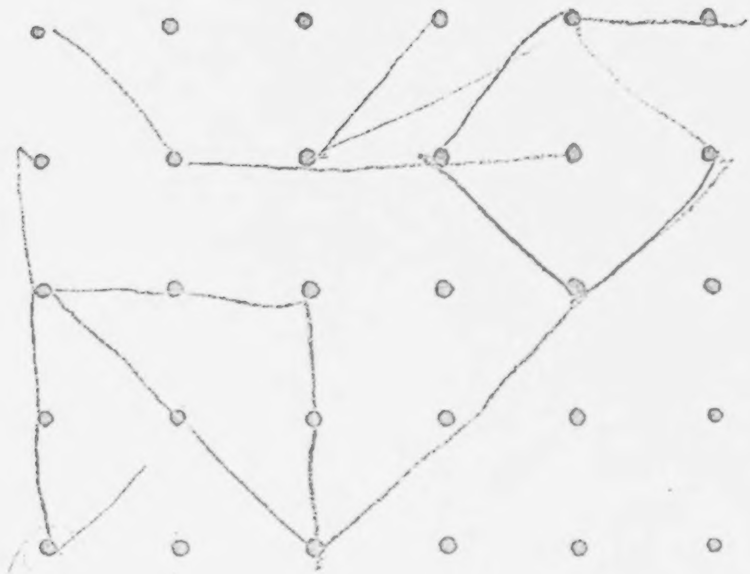
spatial relations deficits

On 6
Cm 3
9

3:38

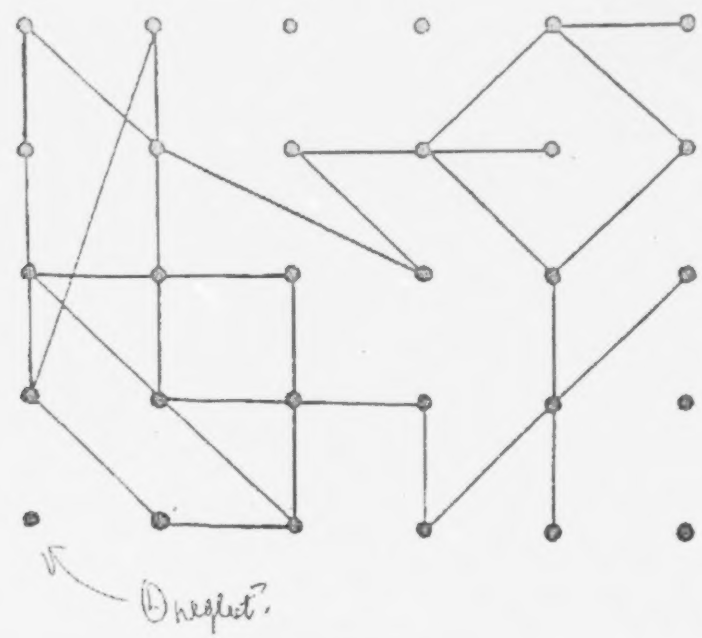


SPATIAL RELATIONS



+1 defect

(wasn't wearing glasses -- stopped him & asked him to try again c̄ glasses)



(-1)

3:40

stopped -- "try again"

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Exit

Current Study

- 149 D.A.M.P. charts reviewed
  - Selected charts if perceptual testing conducted

- Perceptual tests done only if neurological diagnosis, or queried competence
  - 144 complete M.V.P.T.
  - 129 complete Frostig tests

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Current Study

- Demographics

  Diagnoses:

  - 29 Right C.V.A.
  - 25 Dementia (non-differentiated)
  - 20 Left C.V.A.
  - 19 Traumatic Brain Injury
  - 24 Neuromuscular
  - 20 Neurological other
  - 12 Multiple medical (age, concern)

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Current Study

- Sex: 126 male, 23 female
- Age: 18 – 95 years old
  - 54 drivers aged 50 – 69
  - 62 drivers over 70 years

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Data Preparation

- Demographics
- M.V.P.T.
  - Accuracy (total and each section)
  - Time (total and each section)
- Frostig
  - Accuracy (Omissions/Commissions)
  - Time

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Data Preparation

Outcome Recommendation

- Suitable
  - (included "Optional Training")
- Mandatory Training Required
- Unsuitable

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Correlations: MVPT and Frostig

Significant Correlations between:

- MVPT (total score, total time and average time per item)

  and components of Frostig Test
- all are significant ($p<.001$)

MVPT	Commission	Omission	Total Errors	Total Time
Accuracy	-.457	-.447	-.456	-.530
Total Time	.458	.342	.413	.687
Average Time	.463	.367	.434	.693

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Correlations: MVPT and Outcome

- Correlation coefficients ranged from:
  r=.207 (p< .05) (Position in space) to
  r=.53 (p<.001) (MVPT Total Score)

- Interesting relationships:
  - Position in Space Average Time r=.502
  - Figure Ground Average Time r=.452
  - Visual Closure Accuracy r=-.409

Correlations: Frostig and Outcome

- All Frostig components correlated with outcome ($p<.001$)
  - Omission r=.297
  - Total errors r=.337
  - Commission r=.390
  - Total time r=.488

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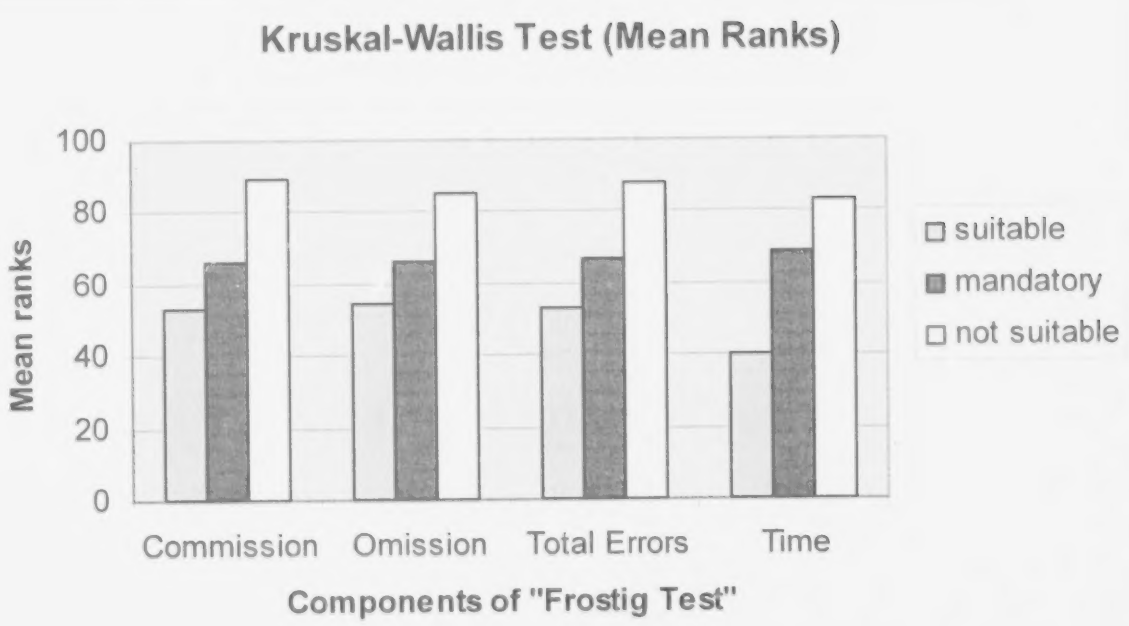
Frostig and Outcome

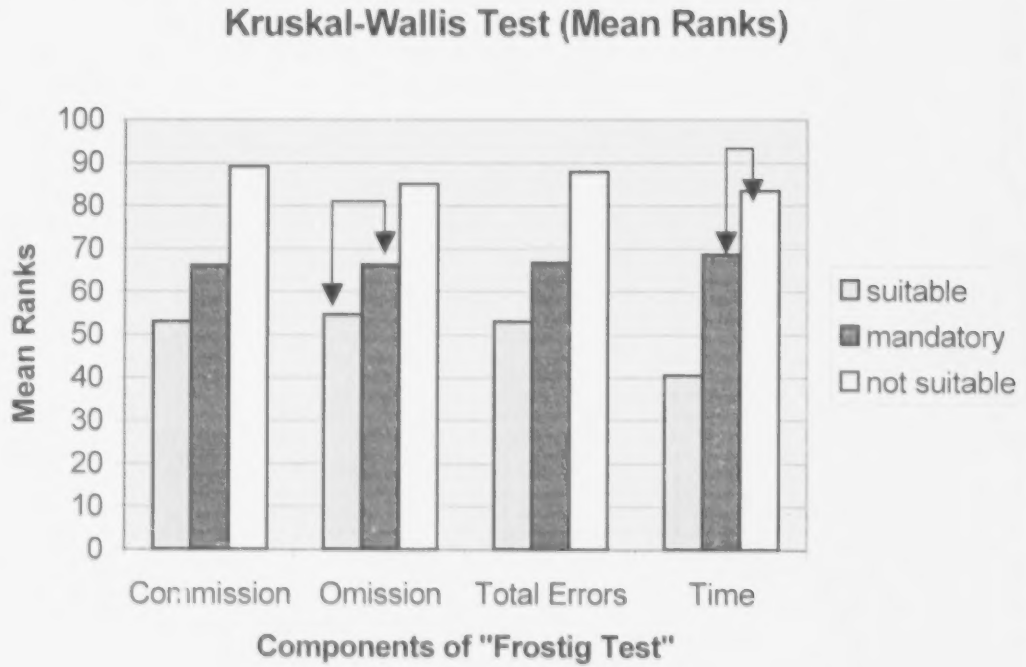
- Significant difference between Outcome groups on:
  - errors of omission
  - commission
  - total errors and
  - total time

  - (Kruskal Wallis Test)

Frostig and Outcome



Frostig and Outcome



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Conclusions

- There are fair to moderate correlations between MVPT and Frostig
- There is a relationship between perceptual testing performance and outcome recommendations
- Potentially useful in clinical decision making

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Suggestions Further Research

Use by Physicians: Further validation

- Frostig: time, commission
- MVPT: visual closure accuracy

Follow-up studies:

Mandatory Training group and

Training / DVL testing results

Driving With Bioptics

Micheline Descent, Jean-Pierre Gagnon
Institut de réadaptation en déficience physique de Québec,
Société de l'assurance automobile du Québec (Quebec City, Quebec)

Abstract

Objective: The project launched in 2001 by the IRDPQ, in co-operation with the SAAQ, has produced its first results, and the participating organizations can now report on the preliminary outcome of their undertaking. The presentation covers the benefits of the training program and the evaluation mechanisms selected for rating persons living with impaired visual acuity. The presentation relates actual experimental results and the findings generated by this initiative to improve the procedures used in Quebec for rating driving aptitude.

Method: Publication of the results called for systematic monitoring of operations. Both quantitative and qualitative data needed to be collected. Data analysis is in progress and will target the project's immediate impact and the value of the procedure followed.

Results: By the end of 2003, the selected candidates will have completed all stages of the training program and will have been tested. Results of the candidates' performance are presented, as well as a preliminary project report and potential future directions.

Conclusion: This long-awaited and widely anticipated evaluation and training program will help to:

- provide reliable and effective ways to develop specific skills that will enable people afflicted with loss of visual acuity to qualify for a driver's permit;
- provide a reliable evaluation mechanism for arriving at recommendations as to a person's ability to drive;
- provide a model that takes into account everything that needs to be checked to establish a person's aptitude for driving;
- make the persons concerned aware of their capabilities and limitations with respect to driving motor vehicles.

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DRIVING WITH BIOPTICS

6th National Workshop for Driver Rehabilitation Specialists

May 27-29, 2004

Edmonton, Alberta

Micheline Descent & Jean-Pierre Gagnon

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A way to encourage mobility and safety

A collaboration of :

- Institut de réadaptation en déficience physique de Québec (IRDPQ)
- Société d'assurance-automobile du Québec (SAAQ)
- IRDPQ 's Foundation
- Office des personnes handicapées (OPHQ)
- CAA-Québec

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LOW VISION

- A population to define
- Situation associated with aging
- Albinism, myopia

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Exit

CONTEXT

- Since 1993, IRDPQ and SAAQ work in collaboration to find means to allow low vision persons to have access to driving

- A project started in October 2001, based on a model used in West Virginia since 1985

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CONTEXT

- In Canada, low vision is considered incompatible with driving
- AAMVA urges member jurisdictions not to licence those who require BTS to meet legal norms for driving
- In Quebec, Public Safety Code recognizes the development of abilities to compensate for a physical impairment

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OBJECTIVES OF THE PROJECT

- Demonstrate that the use of bioptic system can be compatible with driving a personal vehicle

- Support the development of an expertise program at IRDPQ

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Exit

ADMISSION CRITERIA

- Success on SAAQ's theory test
- Visual acuity between 6/18 and 6/60 exclusively and a complete visual field
- Stable eye condition for at least 5 years
- Health condition compatible with driving

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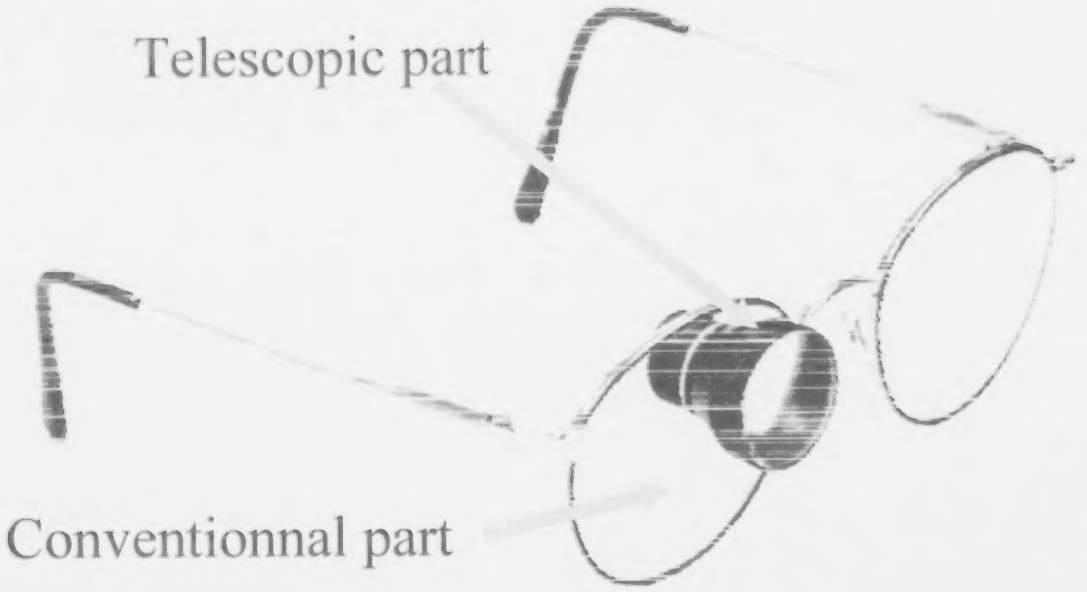
OTHER REQUIREMENTS

- Psychometric evaluation
- Orientation and mobility evaluation
- Evaluation in audiology

- Multidisciplinary team

A bioptic system



Bioptic systems have been used for more than 30 years in 40 states of USA

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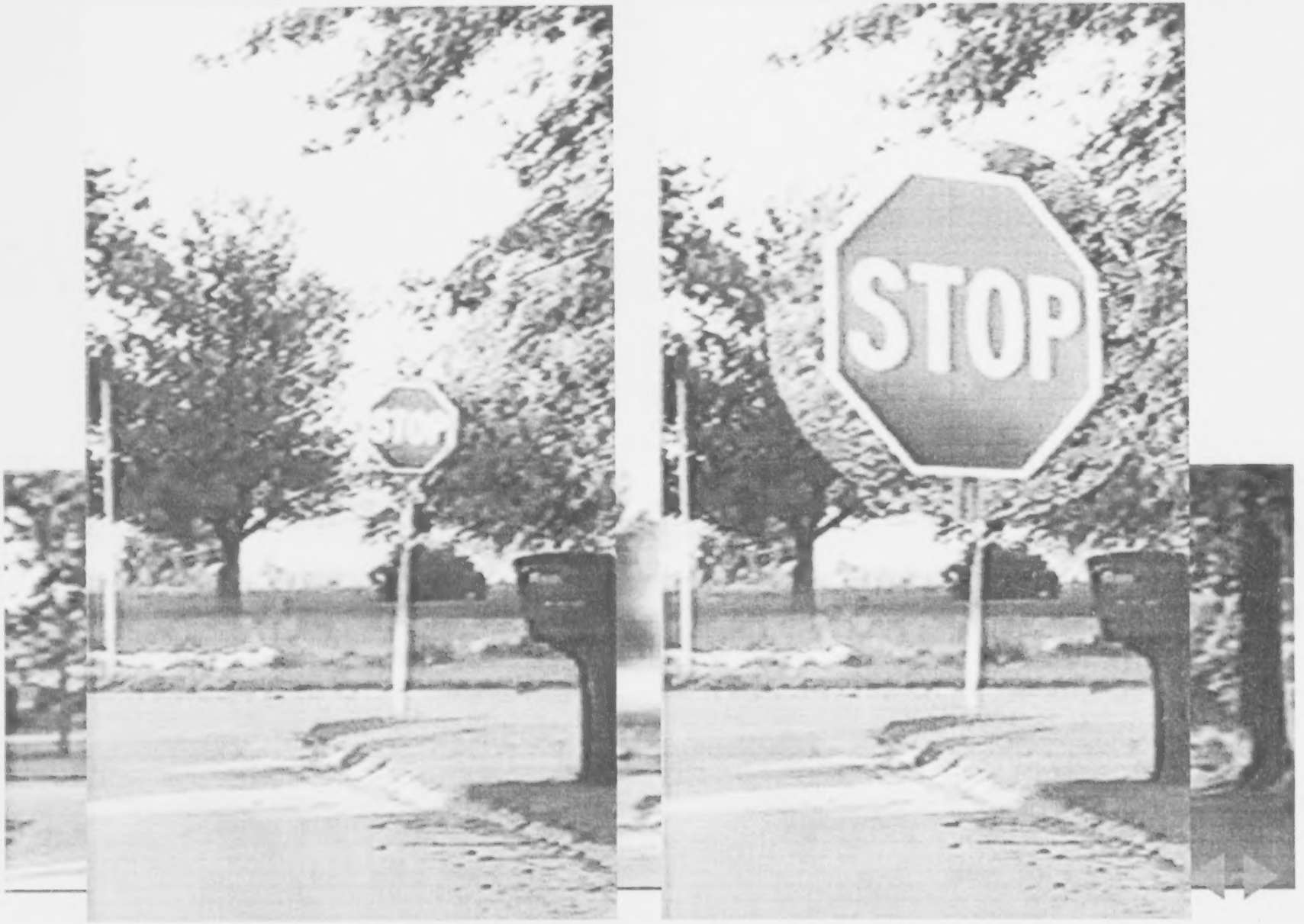

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Easterman OD looking out of BTS

STIMULUS III, BLANC, FOND 31.5 ASB
TAILLE TACHE AVEUGLE NORB SERVICE
CIBLE DE FIXATION CENTRALE
STRATEGIE INTENSITE SINGULIERE
INTENSITE DU STIMULUS 10 DB

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DATE 25-10-01 HEURE 14:20:00
DIAM. PUPILLAIRE AV
LENTILLES DG OCX OEG

PERTES DE FIXATIONS 0/0
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ERREURS FAUS. NEG. 2/5 xx

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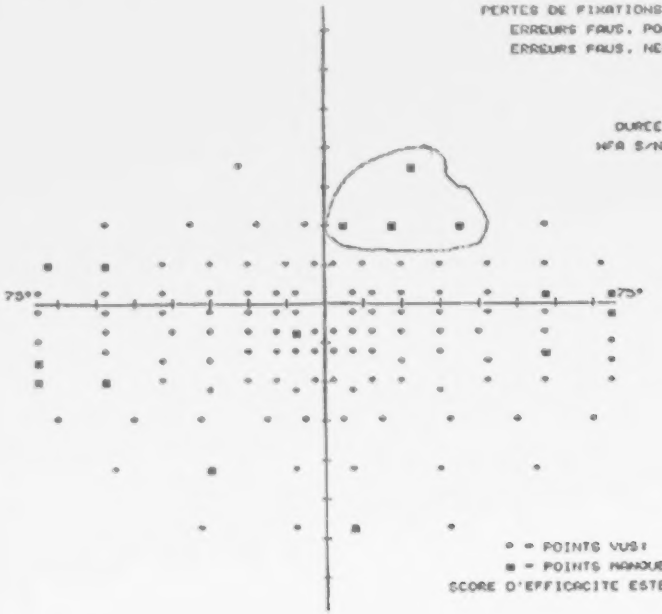

o = POINTS VUS: 104/120
■ = POINTS MANQUES: 16/120
SCORE D'EFFICACITE ESTERMAN: 86

TOUS DROITS RESERVES 1989

REV 9.5

SYM										
RED	0 .1	2.5 1	0 3.2	25 10	79 32	251 100	794 316	2512 1000	7943 3162	1 10000
OD	41 50	36 40	31 35	26 30	21 25	16 20	11 15	6 10	1 5	10

I.R.O.P.Q LOUIS-HEBERT
525 BOUL.HAMEL EST
QUEBEC.QUE.G1M 2S8
418-529-9141
418-529-4211

HUMPHREY SYSTEMS

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Easterman binocular looking in BTS

STIMULUS III, BLANC, FOND 31.5 ASB
TAILLE TACHE AVEUGLE HORS SERVICE
CIBLE DE FIXATION CENTRALE
STRATEGIE INTENSITE SINGULIERE
INTENSITE DU STIMULUS 10 DB

ID 401918 DATE DE NAISSANCE 25-07-74
DATE 25-02-00 HEURE 09:50:50
DIAM. PUPILLAIRE AV
LENTILLES DS DCX DEG

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ERREURS FAUS. NEG. 0/4

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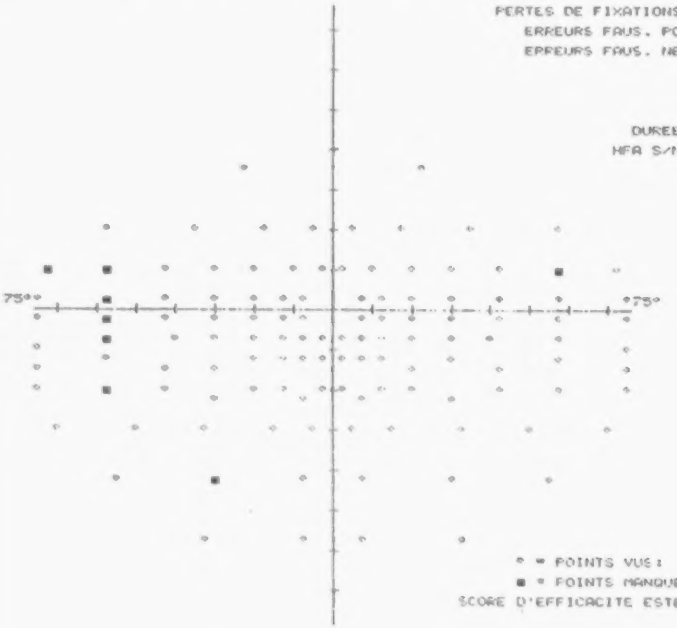

* = POINTS VUS : 112/120
■ = POINTS MANQUES : 8/120
SCORE D'EFFICACITE ESTERMAN : 93

TOUS DROITS RESERVES 1999

REV 9.5

SYM											
ASB	.8 .1	2.5 1	8 3.2	25 10	79 32	251 100	794 316	2512 1000	7943 3162	1	10000
DB	41 50	36 40	31 35	26 30	21 25	16 20	11 15	6 10	1 5		10

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HUMPHREY SYSTEMS

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Concurrent training program

- 8 full-time weeks
- Visual search and use of bioptics
- Orientation techniques and planification of routes
- Spatial consciousness and risk awareness
- Driving techniques

Home

Exit

Continuous evaluation

- Daily feed-back
- Weekly observation in driving situation
- Weekly evaluation with DPM test the last four weeks of the training
- Follow-up with DPM after 3 and 6 months
- Annual evaluation

Home

Exit

Driver Performance Measurement Test

- 82 km route that comprises 5 driving environments : rural, urban, residential, highway and bridges
- 32 different situations for assessment of behavior
- Two evaluators
- Success on test : 75% and +

Home

Exit

Performance indicators

- Visual search
- Speed control
- Direction control
- Did the driver **increase** or **decrease** the possibility of an accident?

Home

Exit

Driving Task Requirements

Negotiates hill (decline)
Negotiates curve to the right
8.2 Turns left onto a rural road.

Stops for stop sign
8.1 Tracks on right side of 2-lane rural road.

Driving Task Requirements

Tracks in center of lane.
Changes lanes to the left as traffic merges from the right
10.4 Maintains vehicle position in center of lane.

Changes lanes to the left as needed to avoid traffic
Maintains vehicle position in lane as ramp narrows to the left
Continues on curve to the right
10.3 Tracks in lane # 2

Traverses curve to the right
Steers right entering lane # 2 of 2 lanes

10.2 Tracks in lanes #3 or #4 .

Changes lanes into the right hand lane
Negotiates curve to the left
10.1 Tracks in lanes #1 or #2

Driving Task Requirements

Stays left to enter a ramp to a high speed roadway
Negotiates curves to the right and left
12.4 Tracks in lane

Negotiates hill
12.3 Steers right to enter ramp to Route IV

Weaves to the right, crossing a white line, crossing from the right
12.2 Negotiates decline and curve to the left

Tracks in lane
Steers right entering lane #2
Negotiates slight hill and curve
12.1 Tracks in lane #4 on a 4-lane ramp

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Exit

Participants

- 13 Adults
- Moderate low vision
- No driving experience

Age of participants

25 - 29 years old	5
30 – 39 years old	7
40 - 49 years old	1

Home

Exit

Education level

High school	3
College	9
University	1

Home

Exit

Visual acuity

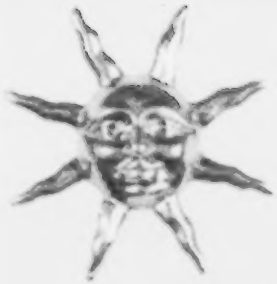
6/18 - 6/24	3
6/30 - 6/36	8
6/48 - 6/60	2

Home

Exit

Main Visual Impairment

Oculo-cutaneous albinism	5
Ocular albinism	3
Pathologic myopia	2
Achromatopsy	1
Optic atrophy	1
Nystagmus	1



Secondary visual impairment

Nystagmus	9
Strabismus	4
Amblyopia	2
Myopia	1
Hypermetropia	1
Blepharophimosis	1

Past use of BTS

Never	7
On regular basis	3
10 years ago and more	3

Home

Exit

Licences issued

	Driver's licence	Learner's licence	No licence
No restriction other than A,F,H,S	3	4	2
With restriction on speed limit and other	4	-	-

Home

Exit

RESULTS

- Project requirements are within participant 's capacity
- The evaluation made it possible to check on participant 's progress and learning retention
- Participants with a favorable recommendation succeeded on SAAQ's road test and got a driver's licence

Home

Exit

RESULTS

- Some participants are now able to drive a vehicle on their own
- Participants enrolling in the program must be highly motivated, dedicated
- Specialists from different fields must work together on the program team

Home

Exit

Follow-up of the project

- It is important to provide for periodic follow-up of participants and of the program
- A model for other driving programs
- Recommendations will be made after the evaluation is completed

Is Specialized Training in Driving Evaluation and Retaining Needed?

Dana Benoit, Isabelle Gélinas
Constance Lethbridge Rehabilitation Centre (Montreal, Quebec)
McGill University (Montreal, Quebec)

Abstract

In their clinical practice, health care professionals are increasingly involved in the screening, assessment and/or training of disabled drivers. Because there is little training available in this very specialized field, most of these professionals learn their needed skills on the job. Very few have completed any specialized training or certification. As a result, the type and quality of services delivered in the area of driver rehabilitation vary considerably from one institution to another. Meanwhile, the onus placed on professionals to make accurate recommendations regarding driving safety and vehicle modification continues to increase. Are they equipped to meet the challenge?

Is Specialized Training in Driving Evaluation and Retaining Needed? *... continued*

In this extended discussion, the panel members will present their experience in developing an instructional program in Quebec to train health care professionals in the screening, assessment and training for drivers presenting with functional limitations. The program's objectives, structure and rationale will be introduced. This will be followed by a group discussion regarding the need for specialized training in driving evaluation, retraining and the prescription of adaptive equipment. Issues pertaining to the type of training that would be most appropriate and the necessity for specialized programs within the rehabilitation continuum will also be addressed. Ultimately it is hoped that this discussion will lead to recommendations regarding the training of health care professionals in the very specialized area of driving.

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Is Specialized Training in Driving Evaluation and Retraining Needed?

Dana Benoit & Isabelle Gélinas

Please take a few minutes to complete your questionnaire

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- Health care professionals are increasingly involved in the screening, assessment and/or training of disabled drivers.

Are they equipped to meet the challenge?

The Problem...

- *"I was performing vehicle modification assessments for about a year before I felt that I really knew what I was doing"*

Where to find information?

- Books?
- Conferences?
- Workshops?
- The mobility dealer?

The daunting field of vehicle modifications...

- *"The more I learned, the more I realized how much I did not know…the details seemed endless!"*

Home

Exit

Are there resources available for training health care professionals in the specialized field of driver rehabilitation?

http://www.autoeduc.ca

➲An educational and professional experience!

Specially developed for health care professionals

- **This program** aims at training professionals who can make a crucial contribution in the driver rehabilitation field through the acquisition of theoretical and practical expertise.

  The theoretical fundamentals are acquired "anytime, anywhere" via the Internet, leaving the freedom to manage time between professional and family obligations;

  The acquired knowledge is consolidated through intensive practical workshops on a one-to-one basis with the supervising therapist;

  The program is offered in French and English;

  It can be completed on a part time basis in less than 18 months.

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E-Learning Positives:

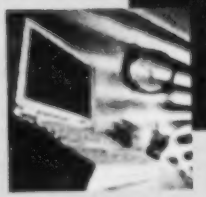
- I do it when and where I want
- I do it at my own speed
- What I need to know is made available through various learning modalities
- Provides opportunity to learn from a number of experts

E-Learning Negatives:

- Lack of lively and spontaneous « converstations »
- Sites are not always easy to navigate
- No « hands-on » learning experience
- Decreased sense of belonging to a peer group

I get to :

- have articles without searching them out
- libarary at my fingertips
- videos
- audio
- quiz feedback
- converse with other students
- get professor feedback quickly
- post questions to peers
- chat
- review



Learning is :

- active
- autonomous
- requires self-responsibility

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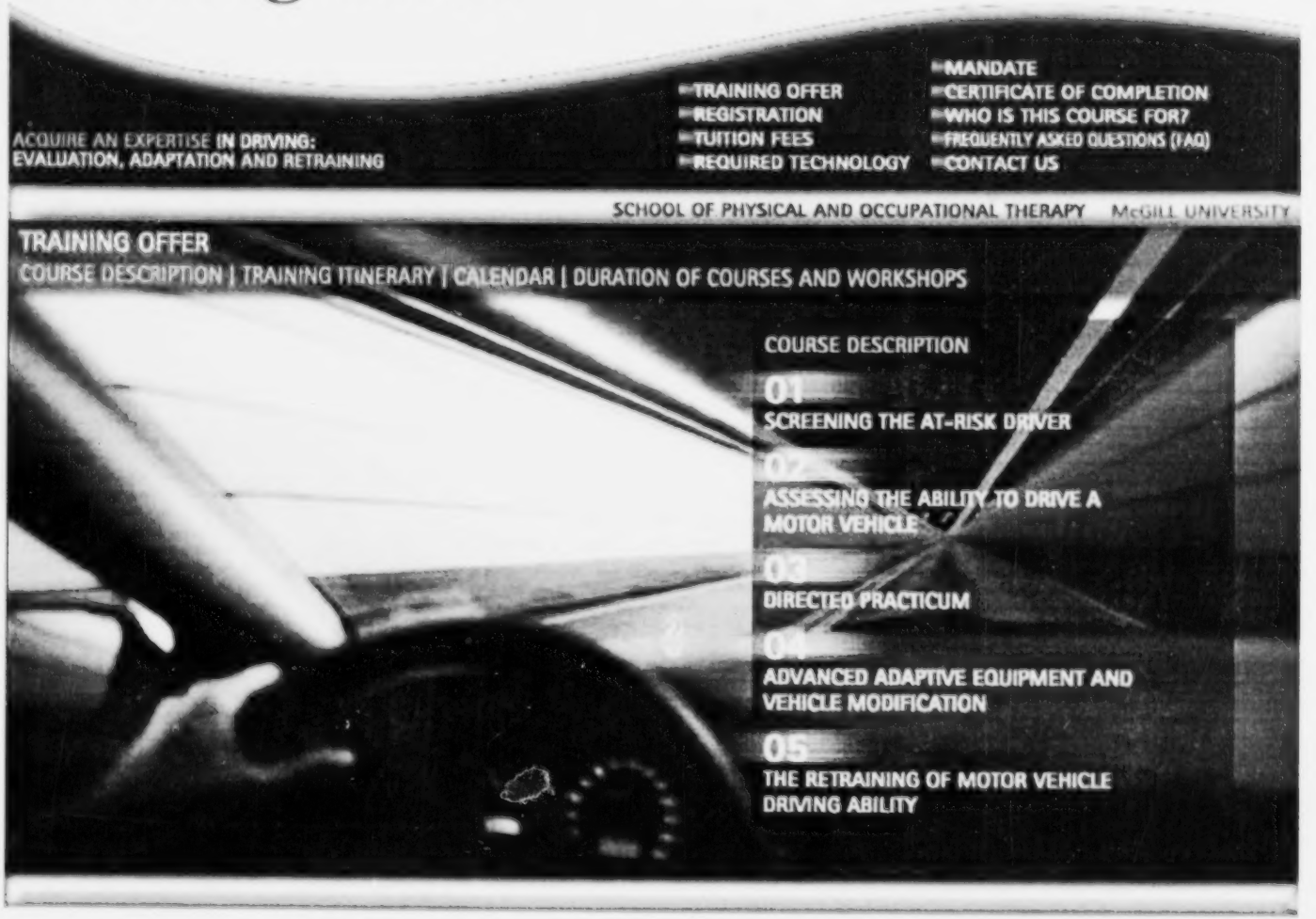
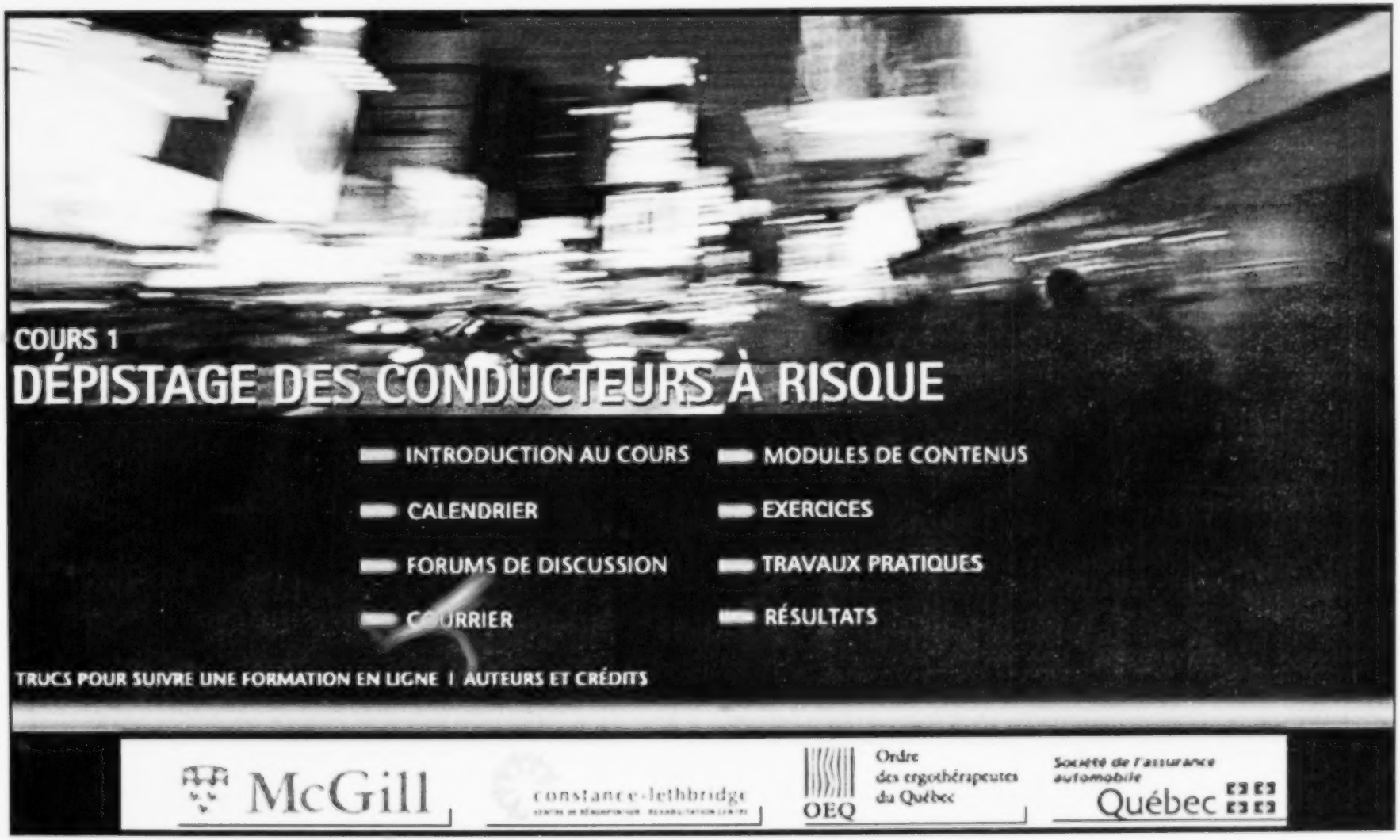
Training Offer




COURS 1
DÉPISTAGE DES CONDUCTEURS À RISQUE
INTRODUCTION AU COURS
MODULES DE CONTENUS
CALENDRIER
EXERCICES
FORUMS DE DISCUSSION
TRAVAUX PRATIQUES
COURRIER
RÉSULTATS
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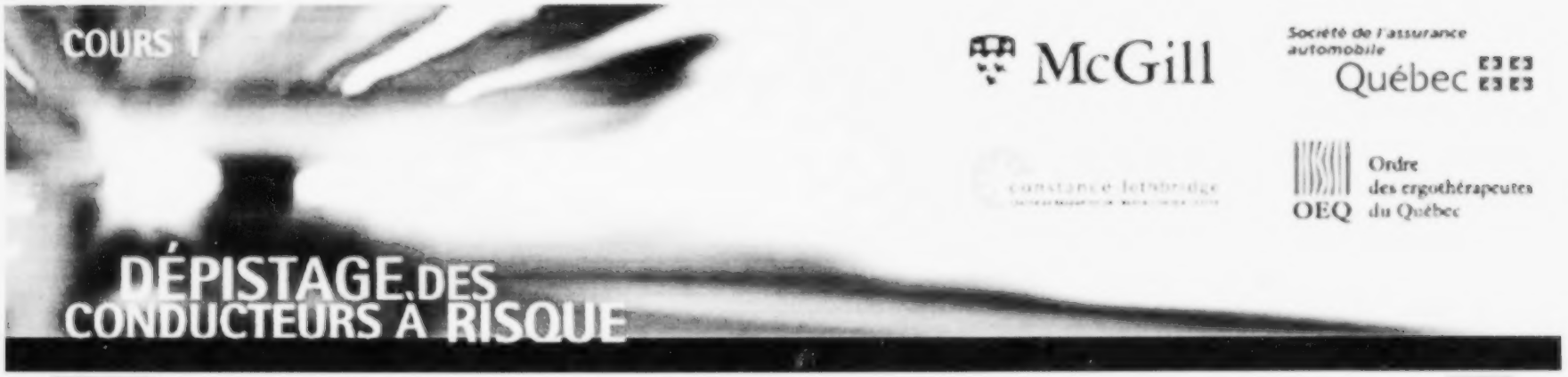
Société de l'assurance automobile
Québec



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QUELS SONT LES GRANDS OBJECTIFS DU COURS?

À la fin de ce cours, l'étudiant sera en mesure de :

1. Nommer les éléments d'aptitude requis pour conduire un véhicule automobile et analyser les effets potentiels de divers déficits fonctionnels sur la conduite automobile.
2. Utiliser différents modèles théoriques de comportement au volant comme cadre de dépistage des conducteurs à risque.
3. Indiquer les règlements et aspects juridiques de la conduite automobile et de la délivrance de permis.
4. Expliquer les principes du dépistage et utiliser des procédés de dépistage appropriés pour identifier les conducteurs à risque dans le continuum du réseau de santé.
5. Déterminer s'il est nécessaire d'orienter des clients vers des centres offrant des services spécialisés d'évaluation de la conduite automobile.

COURS 1

DÉPISTAGE DES CONDUCTEURS À RISQUE

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> VOICI UN BREF APERÇU VISUEL DU COURS...

DEPISTAGE DES CONDUCTEURS A RISQUE

THÈMES D'APPRENTISSAGE	MODULES	CONTENU	EXERCICES ET TRAVAUX PRATIQUES
ACQUISITION DES CONNAISSANCES DE BASE	1	APTITUDES PRÉALABLES POUR LA CONDUITE AUTOMOBILE	E1.1 E1.2
	2	MODÈLES DE COMPORTEMENT AU VOLANT	E2.1
	3	DÉLIVRANCE DES PERMIS POLITIQUES ET ASPECTS JURIDIQUES	E3.1 E3.2
INTÉGRATION DES CONNAISSANCES	4	APTITUDE À CONDUIRE VS CRITÈRE DE CAPACITÉ DE CONDUIRE	E4.1 TP1 (10%)
APPLICATION CLINIQUE DES CONNAISSANCES AU PROCESSUS DE DÉPISTAGE	5	DÉPISTAGE	E5.1 E5.2 TP2 (10%)
	6	DÉPISTAGE CHEZ LES CONDUCTEURS ÂGÉS	E6.1 TP3 (10%)
	7	DÉPISTAGE DANS D'AUTRES CLIENTÈLES PARTICULIÈRES	E7.1 EXAMEN FINAL

MENU ACCÈS RAPIDE

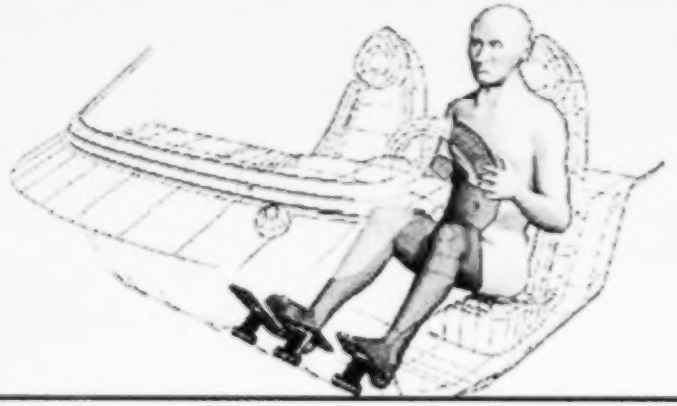
Home

Exit

Vous trouverez ce menu au bas de chaque page du module 1. Il vous permet de visualiser l'ensemble des aspects abordés dans ce module et d'accéder rapidement à chaque section.

PSYCHOMOTRICITÉ

- Portée
- Force
- Endurance
- Rapidité
- Coordination
- Tonus
- Stabilité
- Mobilité



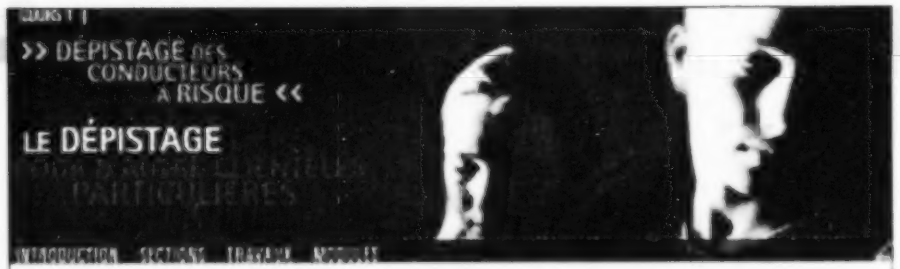
PERCEPTION

- Sensation
- Proprioception
- Audition
- Vision

MENU ACCÈS RAPIDE

COGNITION

- Capacité d'apprentissage
- Attention
- Mémoire
- Fonctions d'exécution
- Automaticité



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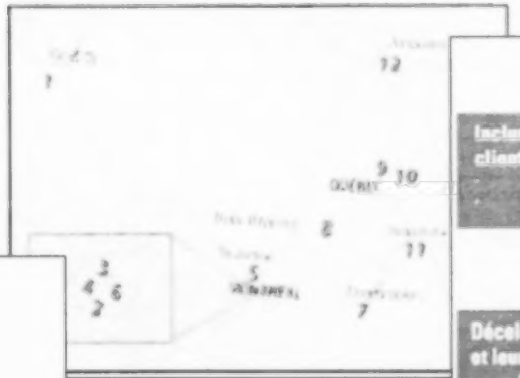
Note :

Il est très important de ne pas négliger l'impact des médicaments. Plusieurs des études qui ont porté sur l'aptitude à conduire dans cette population l'évaluaient en fonction des médicaments utilisés pour traiter ces maladies.



Processus de dépistage pour les professionnels de la santé

Incluez des questions ou des observations spécifiques à la conduite dans votre première entrevue avec le client ou les parents :

- Le client possède-t-il une voiture? Ou le client détient-il un permis de conduire valide?
- Le client conduit-il toujours?

OUI | **NON**

Décelez les problèmes dans les domaines suivants et leur impact potentiel sur la sécurité au volant :

- Antécédents de conduite et comportements actuels au volant
- Antécédents médicaux et médicaments
- Vision et perception
- Cognition
- Capacités psychomotrices

Si le transport est un problème pour la personne et la famille, discuter d'autres modes de transport ou méthodes compensatoires

Déficiences importantes - permanentes	Déficiences importantes - temporaires	Présence de déficiences - impact sur l'aptitude à conduire	Aucune déficience importante, mais possibilité de déclin des capacités	Aucune déficience importante

Travail pratique

Lectures obligatoires

Exercices

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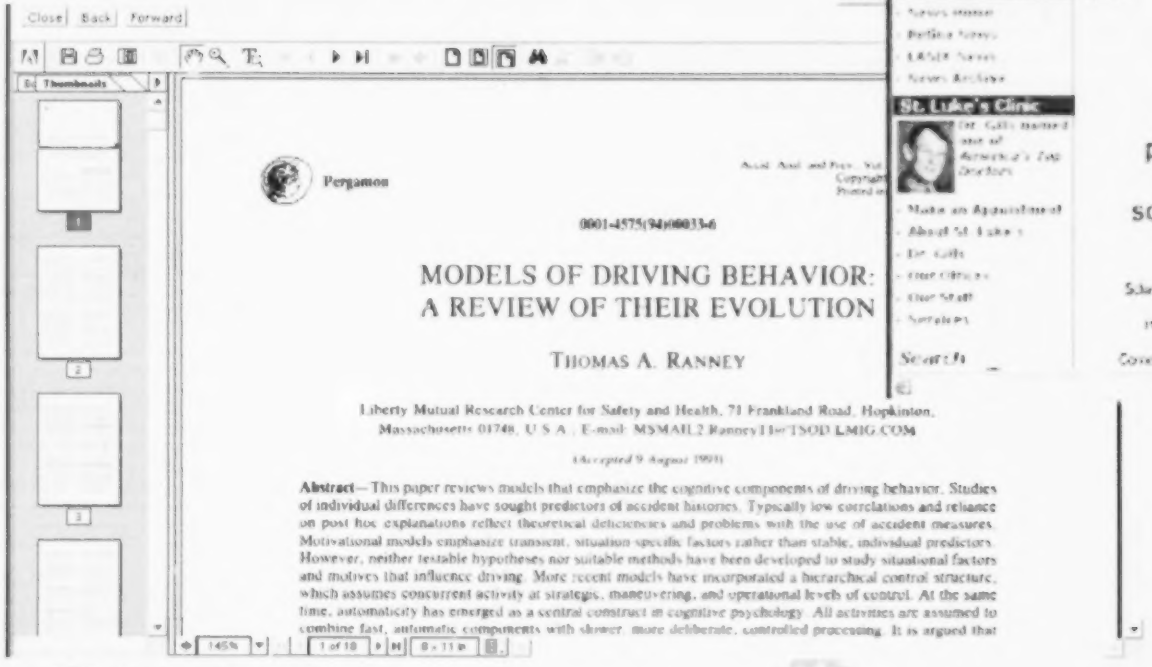
Exit

Lectures obligatoires

- 2.1 Modèles de comportement au volant : un examen de leur évolution (pdf)
  Ranney T., "Models of Driving Behaviour: a Review of their Evolution", Accid. Anal. And Prev., vol. 26, no 6 (733-750), 1994
- 2.2 Bonnes aptitudes de conduite : implications relativement à l'évaluation et la formation (pdf)
  Ranney, T., Good driving skills: implications for assessment and training, Work 8, p. 253-259, 1997.

Lectures recommandées

- 2.1 Inventory of driver training needs and major gaps in the relevant training procedures
  http://www.trainer.iao.fhg.de/achievements.htm



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COURS 1

>> DÉPISTAGE DES CONDUCTEURS À RISQUE <<

LE DÉPISTAGE CHEZ LES CONDUCTEURS AGÉS

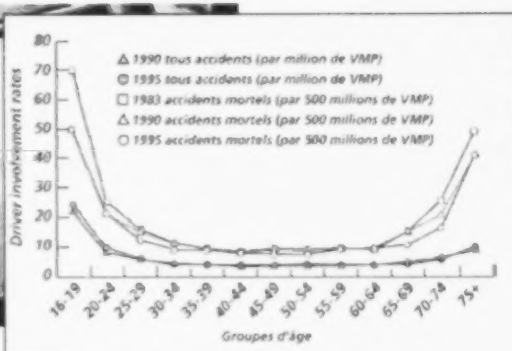


Figure 3 Taux d'implication du conducteur dans tous les accidents signalés par la police (système général d'estimation) par million de véhicules-milles parcourus (VMP) (Nationwide Personal Transportation Survey) pour 1990 et 1995 et pour les accidents mortels (Fatality Analysis Reporting System) par 500 millions de VMP pour 1983, 1990 et 1995 par groupe d'âge.

- « Sur la base de l'estimation des déplacements annuels, le taux de décès des conducteurs de 85 ans et plus est 9 fois plus élevé que le taux des conducteurs âgés de 25 à 69 ans. »iv
- Cela a souvent été attribué aux changements fonctionnels liés à l'âge ainsi qu'à diverses maladies.

***Tableau 2** Projections totales pour les conducteurs impliqués dans des accidents mortels et tous les accidents signalés par la police, les détenteurs de permis et la population âgée de 16 ans et + (âge de conduire)* : 2010, 2020, 2030.*

				% Âge 65 ans +		
Année	*16-64 ans*	*65 ans +*	*Total*	*Implications*	*Détenteurs de permis*	*Population ayant l'âge de conduire*
Implication dans un accident signalé par la police						
1990	*9178232*	*787280*	*9965512*	*8*	*14*	
2010	*10536275*	*1084375*	*11620650*	*9*	*15*	
2020	*10784552*	*1593362*	*12377914*	*13*	*18*	
2030	*11180267*	*2186579*	*13364626*	*16*	*22*	
Implication dans un accident mortel						
1999	*38890*	*6108*	*44998*	*14*		
2010	*44321*	*7721*	*52042*	*15*		
2020	*45478*	*11345*	*56823*	*20*	*Même que ci-dessus*	
2030	*47023*	*15568*	*62591*	*25*		

* US Census Bureau, projections moyennes.

- Les accidents d'automobile impliquant des conducteurs plus âgés sont plus susceptibles d'entraîner des blessures graves ou des décès.

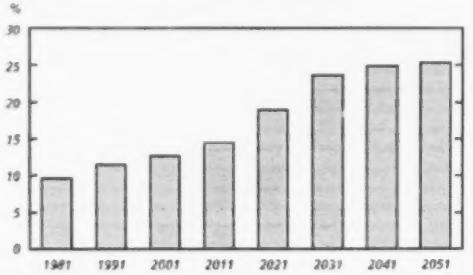
Lecture obligatoire 6.2

- Older driver involvements in police reported crashes and fatal crashes: tre… projections (pdf)

http://www.statcan.ca/english/kits/pdf/social/wheel2.pdf

- En 1998, 12 % de la population canadienne était âgée de 65 ans ou plus. On prévoit que cette proportion augmentera à 20 % d'ici 2020. Une augmentation énorme des personnes âgées est prévue au cours du prochain quart de siècle.
- L'amélioration de l'état fonctionnel de même qu'une culture qui encourage un mode de vie autonome sont susceptibles d'augmenter la population de conducteurs âgés. Un plus grand nombre d'adultes de plus de 65 ans conduiront dans les quelques prochaines décennies.

Proportion of population aged 65 and over could double between 2000 and 2051



- On estime aujourd'hui que la moitié des 3,4 millions de Canadiens de plus de 65 ans possèdent leur propre voiture et s'en servent comme mode de transport principal.

- Les personnes âgées qui conduisent ont la possibilité de mener une vie sociale plus active et de conserver des liens importants avec la collectivité. Ceux qui cessent de conduire sont plus susceptibles de souffrir d'isolement et de dépression.

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Group Discussions

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Feedback

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Conclusion

Thank-you for your input!

Validity of the Cognitive Behavioral Driver's Inventory in Predicting Driving Outcome

Louise Bouillon
Jewish Rehabilitation Hospital (Laval, Quebec)

Abstract

The Cognitive Behavioral Driver's Inventory (CBDI) is a standardized battery specifically designed to assess prerequisite skills for driving and is commonly administered by clinicians in driving evaluation programs. While the CBDI provides information that is useful in understanding driving skills, the ability to accurately identify clients' driving outcome is unknown.

Thus, the objectives of this study are to: 1) determine the ability of the CBDI (and subtests) to predict on-road driving outcome in clients with neurological conditions, 2) determine the sensitivity and specificity of the CBDI, 3) determine the positive and negative predictive values of the CBDI and 4) identify the combination of perceptual tests most predictive of on-road performance for clients with different diagnoses.

Validity of the Cognitive Behavioral Driver's Inventory in Predicting Driving Outcome *... continued*

This historical cohort study included all clients who completed testing at the Driving Evaluation Program at the Jewish Rehabilitation Hospital (2000 – 2003). Results of the CBDI, Motor-Free Visual Perception Test (MVPT), Bells and on-road driving evaluation were abstracted from the medical charts.

T-tests indicated that mean CBDI ($p<0.0001$) and MVPT ($p<0.0001$) scores were significantly worse for those who failed compared to those who passed the driving evaluation. The positive predictive value of the CBDI (fail) was 73% and the negative predictive value (pass) was 71%. Sensitivity and specificity were 62% and 81%, respectively. Results varied according to diagnosis. Logistic regression models identified the CBDI as the most predictive of driving outcome.

Study findings provide a guide for clinicians to identify the most accurate and efficient screening procedure for clients with various diagnoses.

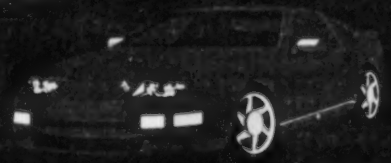
Home

Exit

Validity of the *Cognitive Behavioral Driver's Inventory* in Predicting Driving Outcome

Louise Bouillon B.Sc. (OT)
Barbara Mazer B.Sc. (OT), Ph.D.,
Isabelle Gélinas, B.Sc. (OT), Ph.D.

Centre de recherche interdisciplinaire en réadaptation du Montréal métropolitain
Jewish Rehabilitation Hospital, Laval, Quebec



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We are grateful to:

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Chantal Simard, Ph.D., Neuropsychologist, Jewish Rehabilitation Hospital

Supported by:

Salary Award, Jewish Rehabilitation Hospital Foundation

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BACKGROUND

- Driving is an integral component of modern life and is important for community reintegration
- Disabling neurological conditions often affect sensory, motor, cognitive, perceptual and behavioral functions
- To determine whether a client is a safe driver, rehabilitation therapists require an accurate assessment of their physical, cognitive, and behavioral skills

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BACKGROUND

- Automobile driving:
  - complex functional task
  - requires the integrated use of higher visual processing skills and cognitive functions such as attention, abstract thinking and judgment in a constantly changing environment
- Therapists are responsible for:
  - assessing driving performance based on commonly used pre-driver screening tools and on-road evaluation
  - making recommendations to the provincial licensing bureau regarding individual's fitness to drive

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MOST COMMONLY USED PRE-DRIVER SCREENING TOOLS

- Cognitive Behavioral Driver's Inventory (CBDI)
  (Engum et al.,1988)
- Motor Free Visual Perception Test (MVPT)
  (Bouska & Kwatny, 1982)
- Trail Making Tests A and B
  (Reitan, 1955)
- Bell's Test
  (Gauthier et al., 1989)

Home

COGNITIVE BEHAVIORAL DRIVER'S INVENTORY

Exit

- Standardized screening evaluation tool
- Computerized and manually administered psychometric tasks
- Cognitive/behavioral skills:

  attention, concentration, attention to detail, rapid-decision making, reaction time, visual scanning, visual alertness, simple and complex sequencing, visual-motor coordination

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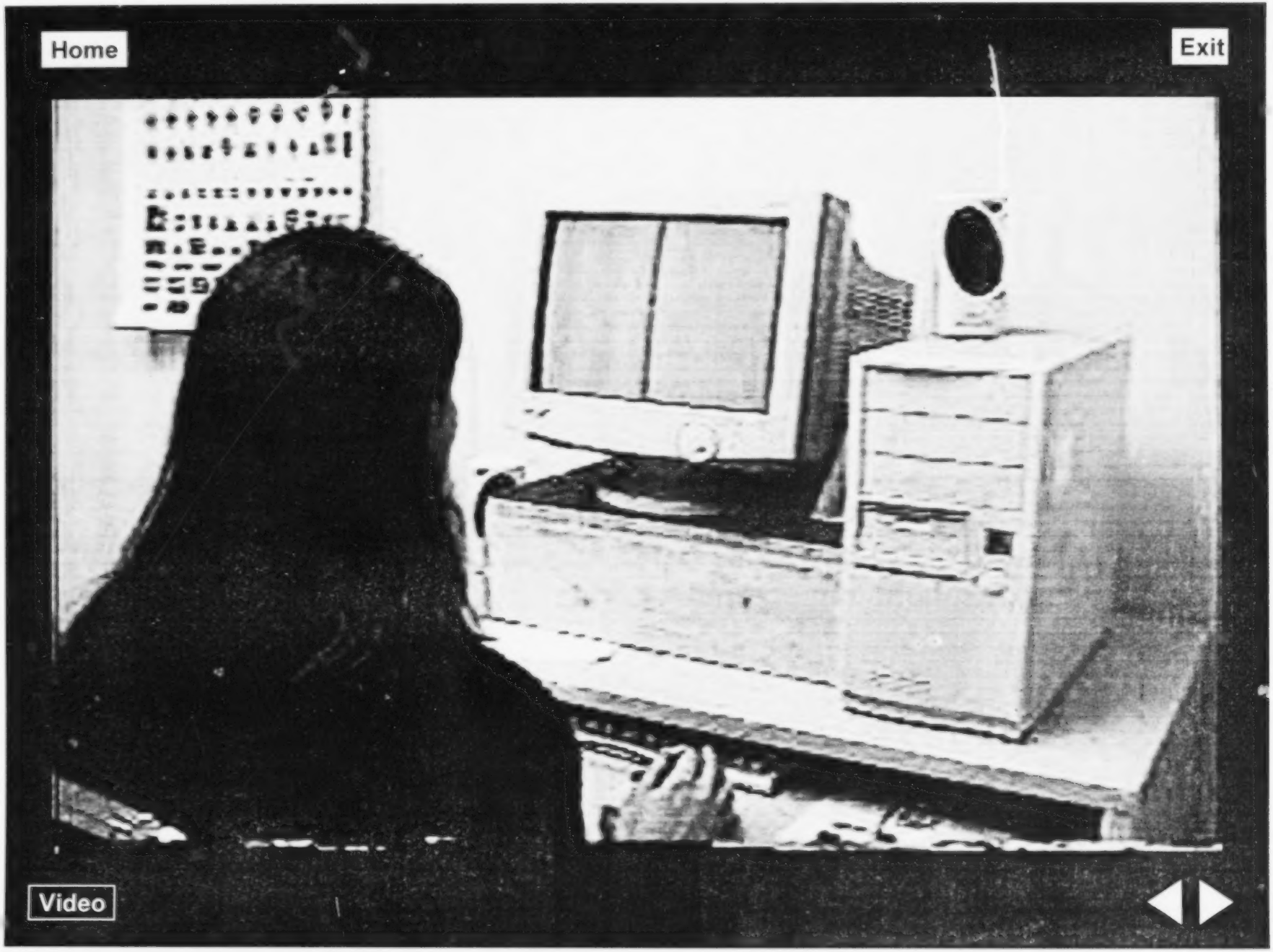
Exit

CBDI TASKS

- IBM compatible computer (Windows 3.1 or later)
- Four computerized tasks (Bracy's Cognitive Rehabilitation Programs)
- Raw scores:
  - Trail making A / B
  - WAIS-R picture completion and digit symbol
  - Brake reaction time
  - Peripheral vision (left and right)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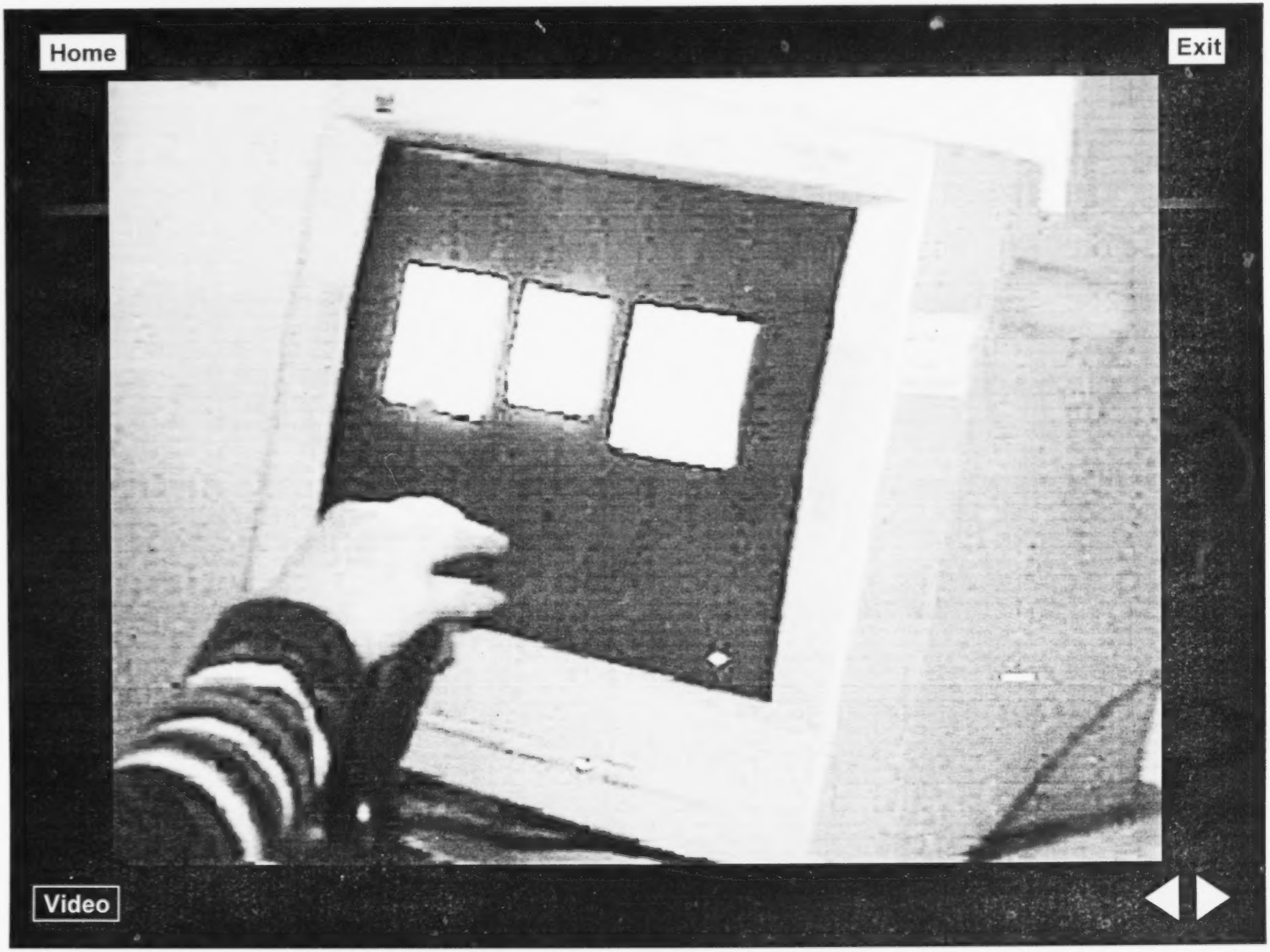
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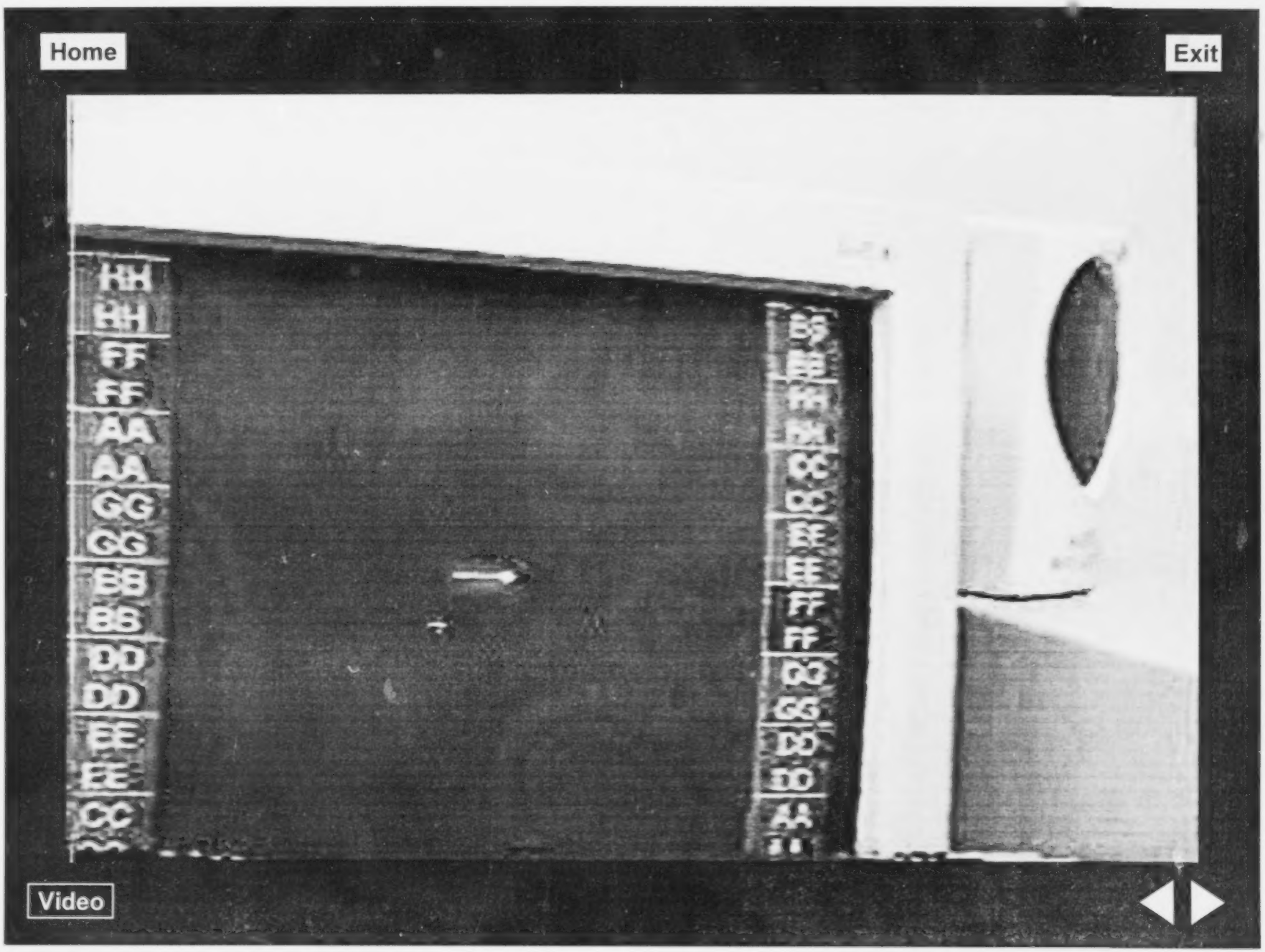
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Video

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Exit

CBDI SCORING

- Average global score: GDI 28 (General Driver Index)
- Standard score:

47 or less	clearly pass
48-51	borderline
52 or greater	clearly fail

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CBDI PSYCHOMETRIC CHARACTERISTICS

Exit

- Internal reliability (Cronbach alpha = 0.95)
- Validity
  - 42 normal controls and 232 patients (right CVA, left CVA, TBI, SCI, other neurological conditions)
  - measured against a road test administered by an independent certified driving instructor
  - examined validity for the group as a whole, not for each diagnostic group

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Exit

CLINICAL CONCERNS

- According to clinicians, association between CBDI scores and on-road driving performance is inconsistent
- CBDI scores are not highly predictive of on-road performance (Klavora et al., 2000)
  - 34% of clients were misclassified
- CBDI predictive values for different diagnoses
- Validity of the CBDI compared to other commonly used driving tools

Home

Exit

OBJECTIVES

- To compare the mean CBDI scores for those who passed and failed the on-road driving evaluation in clients with neurological conditions
- To determine the sensitivity, specificity, and positive/negative predictive values of the CBDI in clients with different diagnoses (L-CVA, R-CVA, TBI, and cognitive decline)
- To compare the validity of the CBDI with other commonly used pre-driver screening tools
- To identify the demographic and clinical factors associated with on-road driving outcome

Home

Exit

STUDY DESIGN

- Historical cohort study
  - Jewish Rehabilitation Hospital Driving Evaluation Program (2000-2003)
  - Medical chart
    - CBDI (GDI28)
    - MVPT score and time
    - Bells test
    - On-road driving performance (pass, fail, lessons)
    - Demographic information

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Exit

SUBJECTS

Inclusion Criteria

- Referred to JRH Driving Evaluation Program
- Neurological condition
- Completed pre-driver screen and on-road evaluation

Exclusion Criteria

- Received their on-road evaluation more than 75 days after the pre-driver screen

Home

Exit

MEASURES

INDEPENDENT VARIABLES

- Cognitive Behavioral Driver's Inventory (CBDI)
- Motor Free Visual Perception Test (MVPT)

  Score: visual perceptual skills

  Time: visual processing time

- Bells Test

  visual scanning and selective attention

Home

Exit

MEASURES

OUTCOME MEASURE

- On-Road Driving Evaluation
  - conducted by an occupational therapist & blind driving instructor
  - based on standard test procedure used by the provincial licensing board in Quebec
  - predetermined route: 17 km course, 60 minutes
  - pass/fail outcome is determined by professional judgement

Home

POTENTIAL CONFOUNDING FACTORS

Exit

- Gender
- Age
- Time since diagnosis
- Time between pre-driver screen and on-road driving evaluation
- Language spoken for the evaluation
- Presence of comprehension/expression difficulties

Home

Exit

DATA ANALYSIS

- Descriptive statistics
- Comparison of mean CBDI test scores for those who passed and failed the road test
  - t-tests
- Calculate:
  - Sensitivity
  - Specificity
  - Predictive values: positive and negative

Home

Exit

DATA ANALYSIS

- Identification of best cutoff CBDI score

  Receiving Operating Curves (ROC)

- Determination of the best tests (CBDI, MVPT, Bell's Test) to predict driving outcome while controlling for potential confounding demographic factors

  Logistic regression

Home

Exit

DATA ANALYSIS

- For all subjects combined (172)
- For the 4 most common diagnostic groups

L-CVA

R-CVA

TBI

Cognitive Decline

Home

DEMOGRAPHIC AND CLINICAL CHARACTERISTICS (172 Subjects)

Exit

Gender n (%)	
Male	135 (78.5)
Female	37 (21.5)
Age [years] mean (SD)	58.9 (17.9)
Language of evaluation n (%)	
French	140 (81.4)
English	24 (14.0)
Other	8 (4.6)
Comprehension level n (%)	
Normal	141 (82.0)
Impaired	31 (18.0)
Expression level n (%)	
Normal	140 (81.4)
Impaired	32 (18.6)

Diagnosis n (%)	
Left CVA	28 (16.3)
Right CVA	20 (11.6)
Other CVA	25 (14.5)
TBI	58 (33.7)
Cognitive decline	23 (13.4)
Multiple sclerosis	7 (4.1)
Other conditions	11 (6.4)
Time from screen to on-road [weeks] mean (SD)	1.83 (1.94)
Time since diagnosis [months] n (%)	
0 - 2.9	23 (13.4)
3.0 - 5.9	55 (32.0)
6.0 - 8.9	34 (19.8)
9.0 - 11.9	17 (9.9)
12.0 - 17.9	17 (9.9)
>18.0	26 (15.1)

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Exit

MEAN TEST SCORES FOR PASS/FAIL OUTCOME

Diagnosis	CBDI (GDI28)	MVPT Score	MVPT Time	Bells Test
All Subjects (n=172)				
Pass (n=93)	44.97 (3.22)	32.92 (3.12)	4.63 (2.30)	32.96 (2.16)
Fail (n=79)	50.75 (7.54)	29.89 (4.24)	6.11 (2.45)	32.28 (2.40)
p-value	< 0.0001	< 0.0001	0.0002	0.06
Left CVA (n=28)				
Pass (n=15)	47.60 (3.74)	30.79 (5.13)	5.42 (2.28)	33.21 (1.97)
Fail (n=13)	51.23 (9.51)	28.85 (3.50)	6.36 (2.35)	32.54 (2.15)
p-value	0.22	0.27	0.32	0.4
Right CVA (n=20)				
Pass (n=9)	45.00 (2.35)	32.89 (3.33)	5.36 (2.24)	33.00 (1.50)
Fail (n=11)	49.55 (3.39)	30.18 (4.47)	6.74 (2.76)	32.46 (2.42)
p-value	0.003	0.15	0.28	0.56
TBI (n=58)				
Pass (n=42)	43.57 (3.07)	33.84 (2.03)	4.00 (2.43)	33.36 (1.83)
Fail (n=16)	46.00 (3.10)	33.79 (2.33)	4.83 (1.91)	32.93 (1.90)
p-value	0.01	0.94	0.26	0.46
Cognitive Decline (n=23)				
Pass (n=4)	46.75 (3.77)	31.75 (1.26)	5.75 (2.09)	32.00 (1.15)
Fail (n=19)	53.58 (7.19)	27.53 (3.67)	6.80 (1.77)	31.05 (3.29)
p-value	0.08	0.04	0.31	0.58

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SENSITIVITY, SPECIFICITY, PV

Exit

Cutoff = 47

DRIVING

CBDI	Fail	Pass	Total
Fail	49	18	67
Pass	30	75	105
Total	79	93	172

Sensitivity	**0.62**
Specificity	**0.81**
PV+	**0.73**
PV-	**0.71**

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SENSITIVITY, SPECIFICITY, PV

Cutoff = 47

Exit

DRIVING

CBDI	Fail	Pass	Total
Fail	49	18	67
Pass	30	75	105
Total	79	93	172

Sensitivity	**0.62**
Specificity	**0.81**
PV+	**0.73**
PV-	**0.71**

Home

SENSITIVITY, SPECIFICITY, PV

Exit

Cutoff = 45

DRIVING

CBDI	Fail	Pass	Total
Fail	68	41	109
Pass	11	52	63
Total	79	93	172

Sensitivity	**0.86**
Specificity	**0.56**
PV+	**0.62**
PV-	**0.83**

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SENSITIVITY, SPECIFICITY, PV

Exit

Cutoff = 45

DRIVING

CBDI	Fail	Pass	Total
Fail	68	41	109
Pass	11	52	63
Total	79	93	172

Sensitivity	**0.86**
Specificity	**0.56**
PV+	**0.62**
PV-	**0.83**

Home

CUTOFF VALUES FOR DIAGNOSTIC GROUPS

Exit

DIAGNOSIS	Cutoff
Left CVA	45
Right CVA	44
TBI	42
Cognitive impairment	46

Home

MULTIVARIATE LOGISTIC REGRESSION RESULTS

Exit

Variable	β	Standard Error	χ2	p	Odds Ratio	Confidence Interval
Whole Group						
CBDI	-0.33	0.06	31.28	<0.0001	0.72	0.64-0.81
Left CVA						
Time since diagnosis	-0.48	0.20	5.89	0.02	0.62	0.42-0.91
Right CVA						
CBDI	-0.61	0.28	4.93	0.03	0.54	0.32-0.93
TBI						
CBDI	-0.24	0.10	5.63	0.02	0.79	0.64-0.96

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Exit

DISCUSSION

- Individually, CBDI, MVPT Score and MVPT Time were significant predictors of on-road outcome for the group as a whole

  Finding the best test: CBDI is sufficient by itself to predict on-road outcome for the group as a whole

  CBDI significant predictor for R-CVA and TBI

- Demographic and clinical factors: only *time since diagnosis* for the L CVA group significantly contributed to the model

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Exit

CONCLUSION

- While CBDI scores are, on average, higher in those who fail the road-test, they are not sufficiently predictive of driving outcome to replace the on-road driving evaluation
- CBDI appears to discriminate between pass and fail for R-CVA and TBI
- Different screening tools are needed to more accurately predict driving performance for clients with L-CVA and cognitive decline
- Validation with a larger sample size for some diagnoses are necessary

L'influence de l'administration partielle du *Cognitive Behavioral Driver's Inventory* sur sa validité de critère : une étude exploratoire et rétrospective

Josée Duquette
Constance-Lethbridge Rehabilitation Centre (Montreal, Quebec)

Abstract

The Cognitive Behavioral Driver's Inventory (CBDI) is a standardized in-house test battery designed to assess the cognitive skills related to fitness to drive, and to predict whether the person will pass or fail the road test. American studies have shown that the CBDI has good predictive validity. However, in most of Quebec's rehabilitation facilities, the CBDI is administered only partially.

Goals: To compare the efficiency and the criterion validity (predictive validity, sensitivity, specificity) of the full versus the partial test administration of the CBDI to persons with sustained and non-progressive cerebral damage.

Method: The CBDI and the road test results of 245 individuals with a TBI or CVA, assessed in three driving evaluation programs in the Montreal area,

L'influence de l'administration partielle du Cognitive Behavioral Driver's Inventory *sur sa validité de critère : une étude exploratoire et rétrospective*

... continued

were retrospectively analyzed. The CBDI was administered in full in one of the programs, and partially in the others.

Results: The CBDI administered in full correctly predicted 60% of the road test results. When partially administered, its efficiency decreased to 51%. The CBDI was better at detecting subjects who passed the road test than those who failed it. The rate of false positives was 25%, and the rate of uncertain predictions varied between 21% and 34%.

Conclusion: In the context in which the CBDI is administered in the Montreal area, its criterion validity seems to decrease with the partial administration of the test, and its sensitivity to detect road test failures seems to remain low even during a full administration. Given the limits of this study, it is difficult to come to any conclusion. More rigorous studies would be necessary to verify the criterion validity of the CBDI in Quebec.

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Exit

L'influence de l'administration partielle du *Cognitive Behavioral Driver's Inventory* sur sa validité de critère: une étude exploratoire et rétrospective

Josée Duquette, M.Sc, erg
Barbara Mazer, Ph.D., erg
Louise Bouillon, erg
François Lemieux, étudiant
Marie Vanier, Ph.D.
Isabelle Gélinas, Ph.D., erg
Jacques Gresset, Ph.D., O.D.
Dana Benoit, erg, CDRS
Johanne Lavallée, erg
Patricia McKinley, Ph.D.

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Le *Cognitive Behavioral Driver's Inventory (CBDI)*

Exit

- Outil d'évaluation en salle, standardisé et validé
- Aide à l'évaluation des habiletés cognitives nécessaires pour opérer de façon sécuritaire un véhicule motorisé (comportements opérationnels)
- Clientèle cible: personnes avec déficience cognitive ou comportementale (TCC, AVC)

(Bracy, Engum & Lambert, 1990)

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Exit

Le CBDI (...suite)

- 10 tâches psychométriques (habiletés visuo / perceptivo / motrices)

  - Temps de réaction de freinage
  - WAIS-R Digit Symbol
  - WAIS-R Picture Completion
  - Halstead-Reitan Trail A
  - Halstead-Reitan Trail B
  - Périmétrie gauche et droite

  } Administration manuelle

  - Réaction différentielle visuelle (3 sous-tests)
  - Balayage visuel

  } Administration informatique

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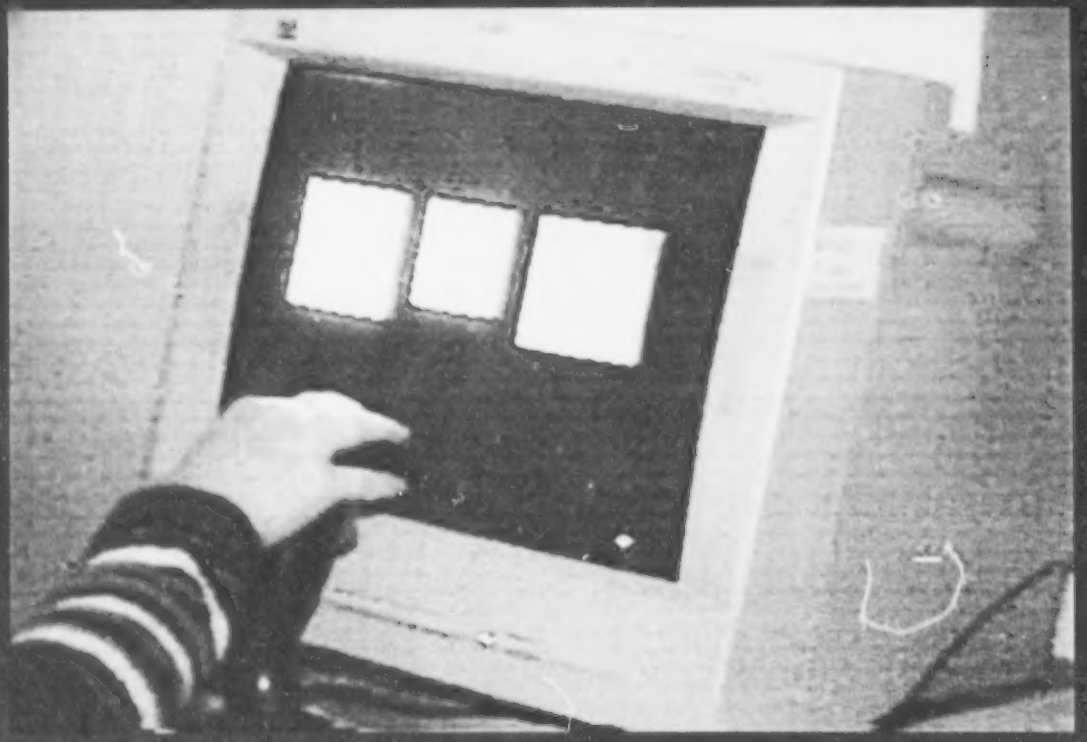

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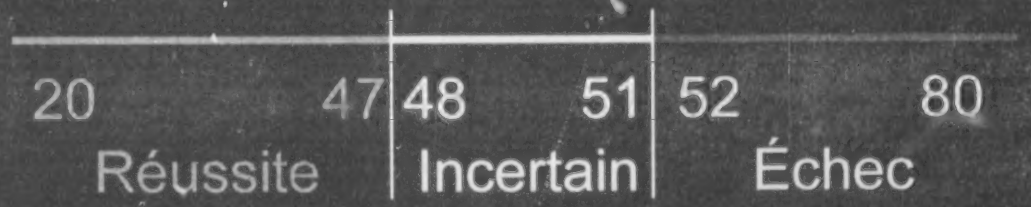
Exit

Le CBDI (...suite)

- 10 tâches psychométriques (habiletés visuo / perceptivo / motrices)
- 28 scores bruts, transformés par le logiciel CBDI en scores standardisés
- Moyenne des 28 scores standardisés = **GDI28**
- Prédiction du statut sur la route en fonction du GDI28



- Bonnes propriétés psychométriques

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Problématique

Dans plusieurs établissements du Québec,
le CBDI n'est administré que ***partiellement.***

Valeur de 50
accordée par défaut par le logiciel
aux items non mesurés

⇩

Risque de modification du GDI28
et de la prédiction
du statut sur la route

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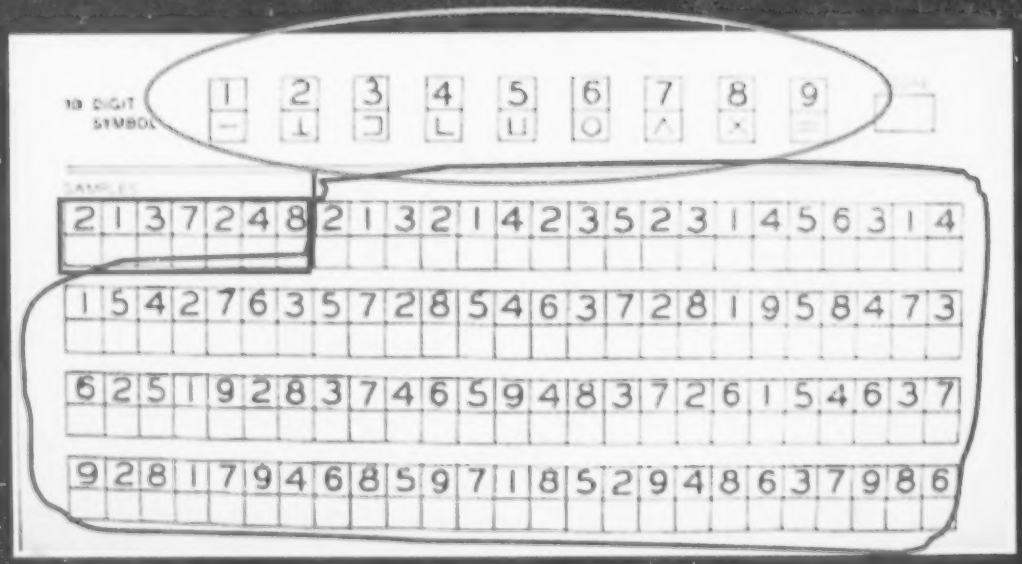
Tests non administrés

Wais-R
Digit Symbol



Wais-R
Picture Completion

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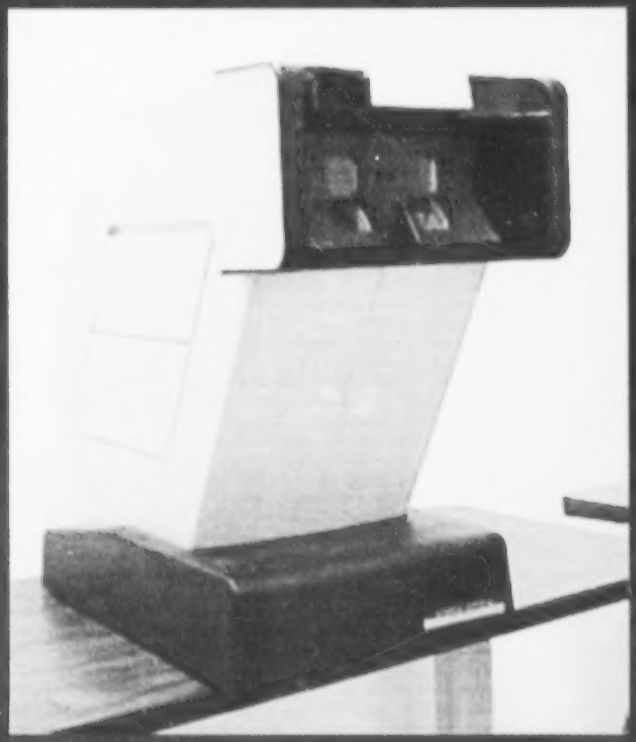
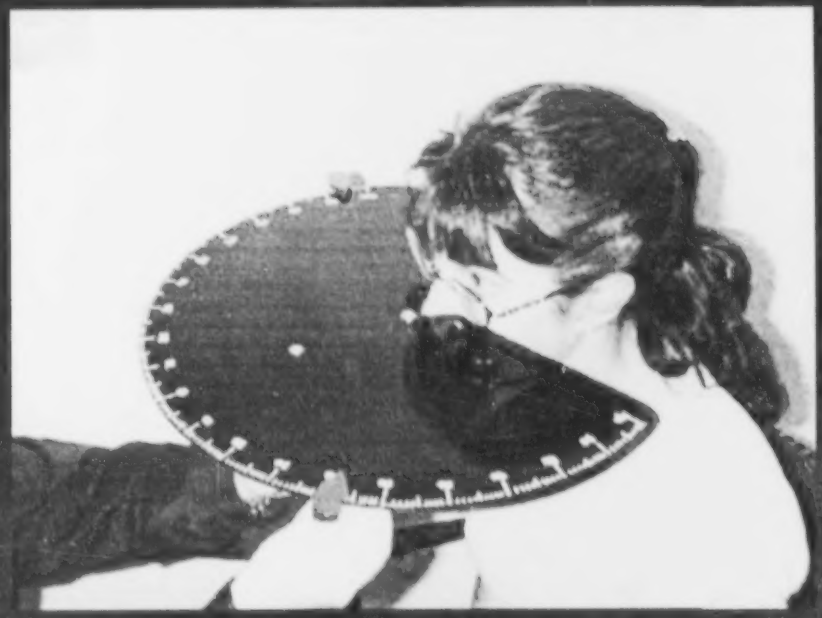
Tests non administrés (... suite)

Périmétrie





Home

Exit

Exemple

Complet

- Trail making A: 46
- Trail making B: 47
- périmètre gauche: 41
- périmètre droit: 41
- WAIS-R Dig. Symb.: **48**
- WAIS-R Pict Compl.: **47**
- VRDR: 46
- etc...

GDI28 = 47 (réussite)

Sans les WAIS-R

- Trail making A: 46
- Trail making B: 47
- périmètre gauche: 50
- périmètre droit: 50
- WAIS-R Dig. Symb.: **50**
- WAIS-R Pict Compl.: **50**
- VRDR: 46
- etc...

GDI28 = 48 (incertain)

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Exit

Objectif principal

Vérifier, de façon exploratoire,
si l'administration *partielle* du CBDI,
comparativement à son administration *intégrale*,
a un impact significatif sur
sa validité concourante et sur son efficience.

Home

Exit

Méthodologie

Consultation des dossiers fermés (sept 1998 – avril 2001) des programmes d'évaluation de la conduite automobile de 3 établissements de réadaptation de la région de Montréal.

- Rapport d'évaluation CBDI
- Rapport synthèse destiné à la Société d'Assurance Automobile du Québec

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Critères d'inclusion

1. Dommage cérébral acquis et non évolutif (AVC ou TCC)
2. Sujet évalué à l'aide du CBDI et sur la route.
3. Administration du CBDI
   - en entier (C1)
   - avec omission seule des deux WAIS-R (C2)
   - avec omission seule des deux WAIS-R et des deux périmétries (C3)
4. Intervalle ≤ 75 jours entre l'administration du CBDI et le test sur la route.

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Exit

Analyses

- Analyses descriptives
  - Données démographiques
  - CBDI
  - Route
- Indicateurs de validité concourante et d'efficience du CBDI
  a) tel qu'administré dans chaque centre
  b) avec transformation des données
     - C1: CBDI-**W**, CBDI-**P**, CBDI-**W-P**
     - C2: CBDI-W-**P**

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Exit

Échantillon

- 344 dossiers potentiels
- Après vérification, élimination de 99 dossiers.

Total des dossiers retenus: **245**

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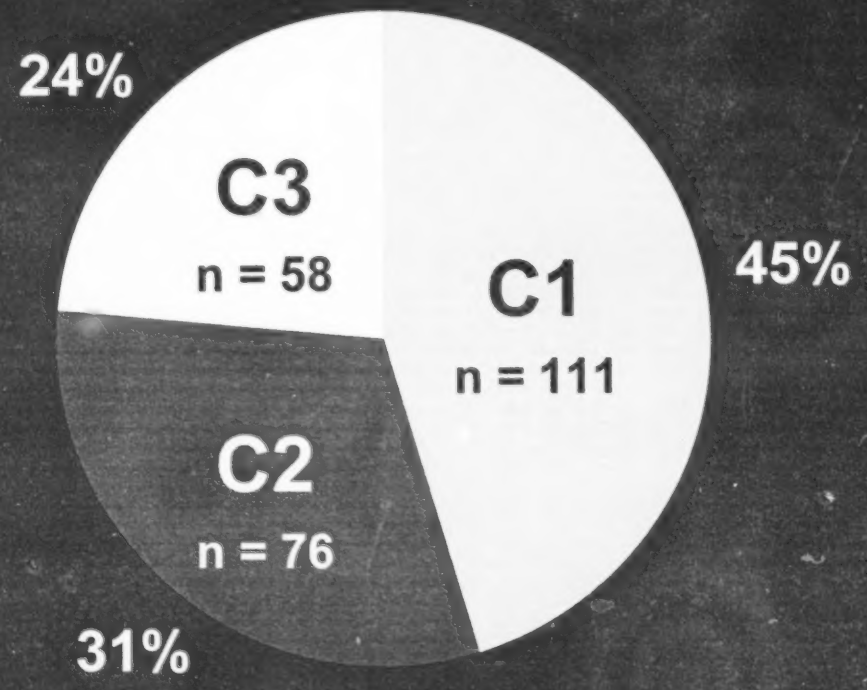
Exit

Distribution des sujets par établissement



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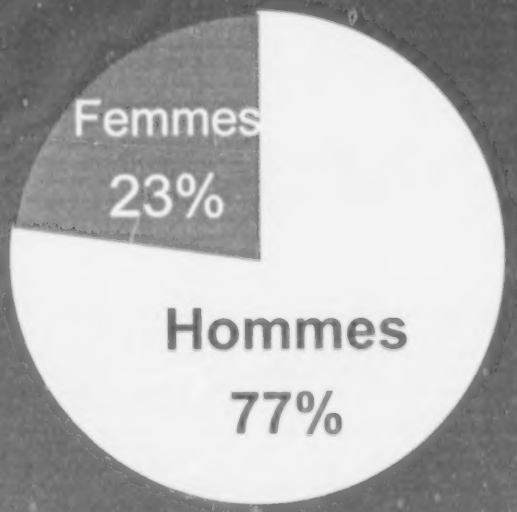
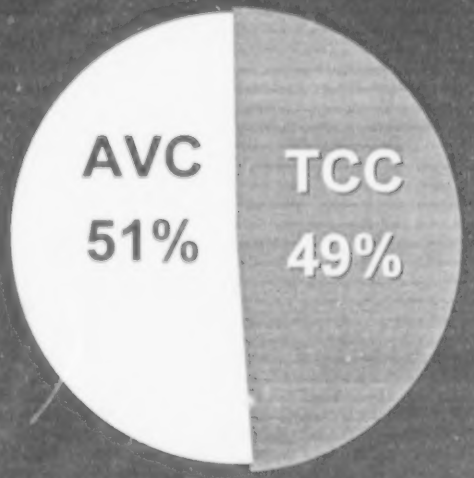
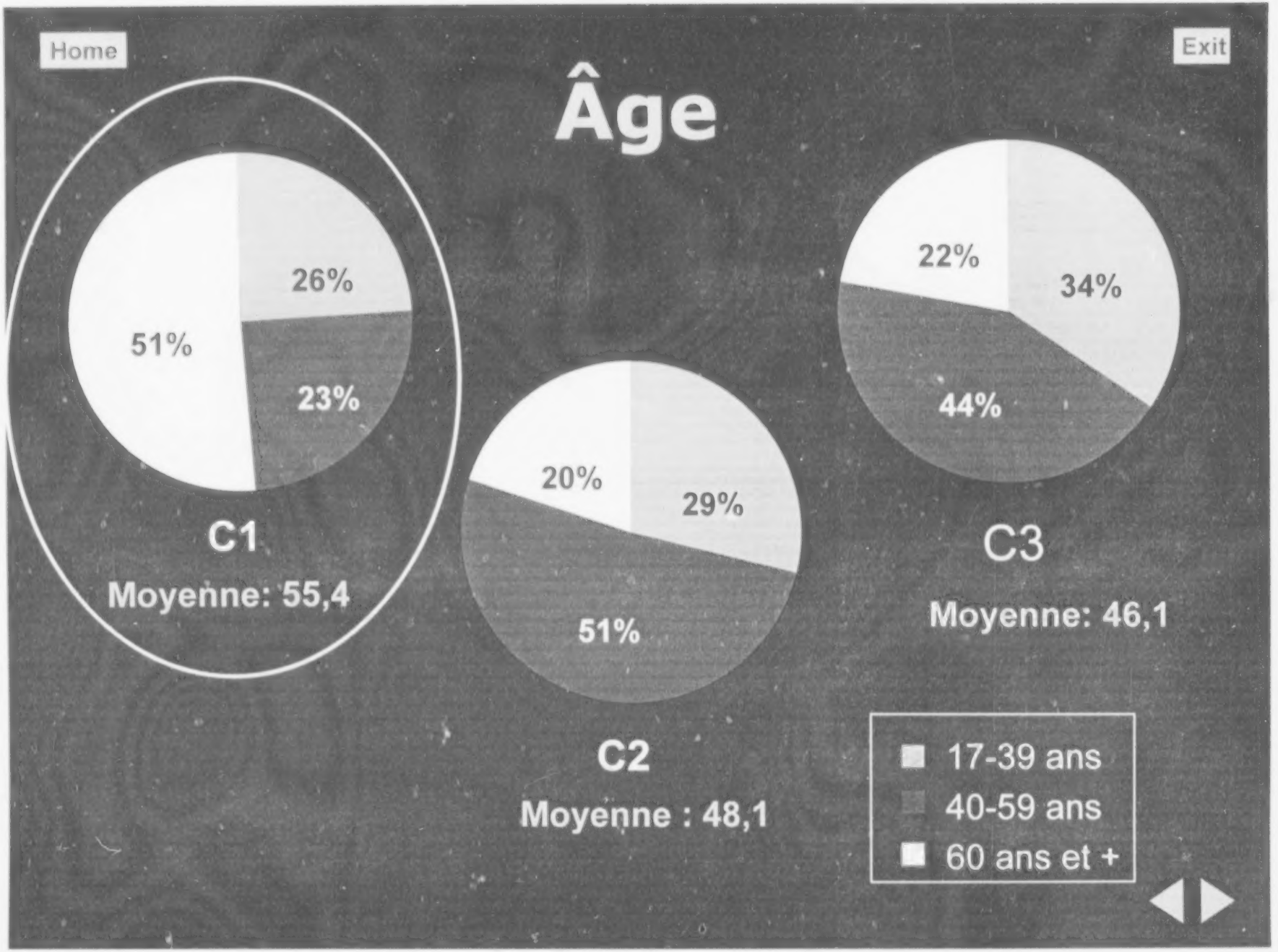


Diagnostics




Home
Exit
Âge
26%
51%
23%
C1
Moyenne: 55,4
20%
29%
51%
C2
Moyenne : 48,1
22%
34%
44%
C3
Moyenne: 46,1
17-39 ans
40-59 ans
60 ans et +

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Exit

Test sur route

- Ergothérapeute et moniteur
- Circuit: ville et autoroute
- Durée: AVC = 60 min; TCC = 90-120 min
- Observation de manœuvres et de comportements

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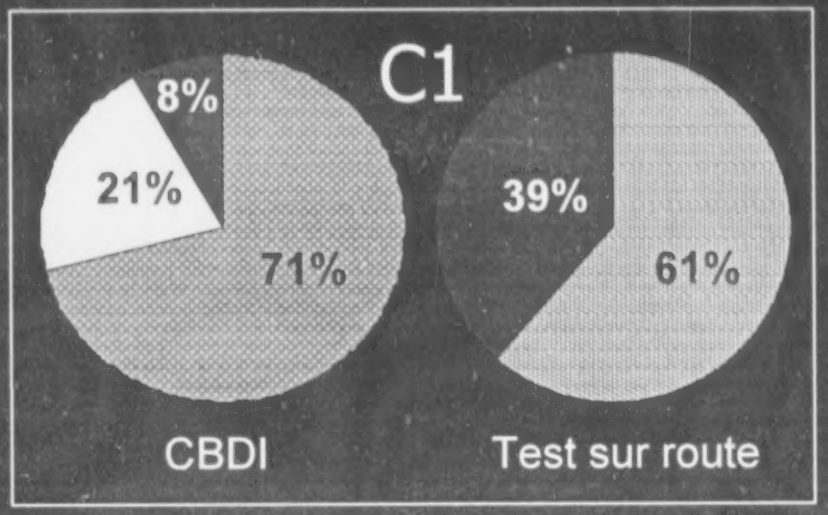
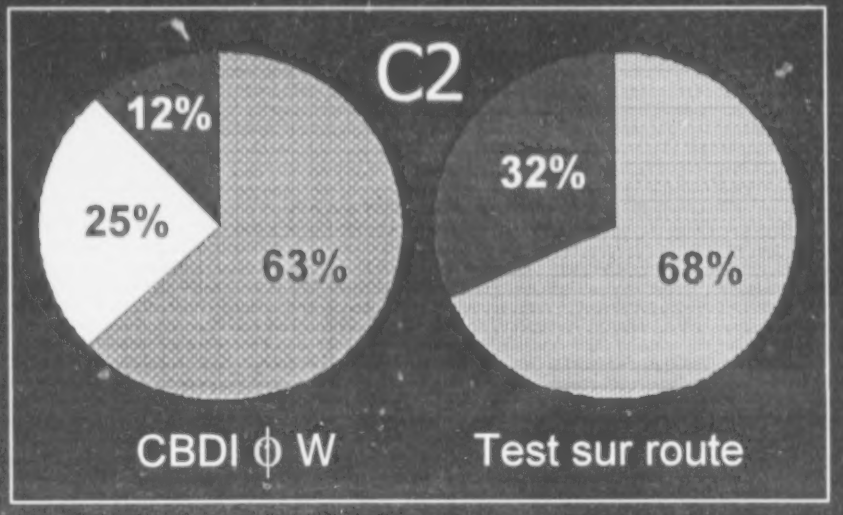
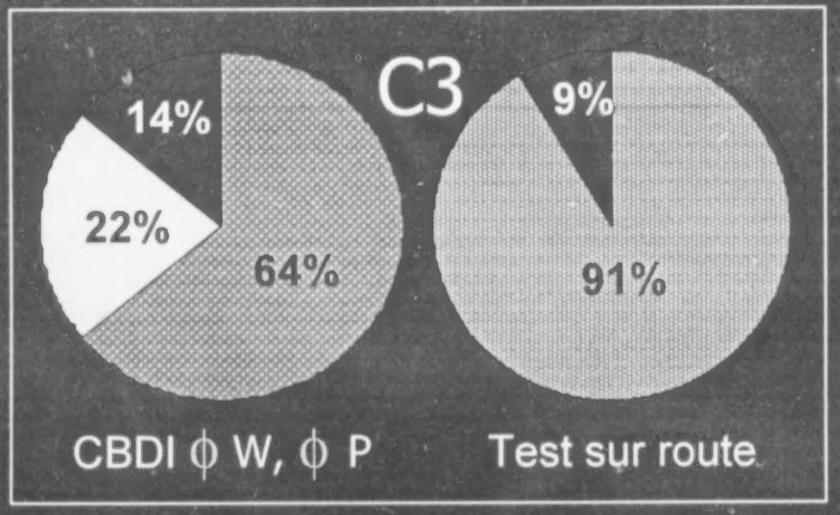
Exit

CBDI et test sur route: résultats







Réussite
Échec
Incertain

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Exit

Impact de l'administration partielle du CBDI

Home

Exit

Effets de la non-administration des WAIS-R et de la périmétrie

C1

CBDI complet

CBDI	Route: Échec	Réussite	TOTAL
Échec	9	0	9
Incertain	13	10	23
Réussite	21	58	79

1 (Échec → Incertain)

6 (Incertain → Réussite)

10 (Incertain → Réussite)

ϕ WAIS, ϕ périmètre

CBDI	Route: Échec	Réussite	TOTAL
Échec	**10**	0	10
Incertain	18	20	38
Réussite	15	**48**	63

Home

Exit

Effets de la non-administration des WAIS-R et de la périmétrie

C1

CBDI complet

CBDI \ Route	Échec	Réussite	TOTAL
Échec	9	0	9
Incertain	13	10	23
Réussite	21	58	79

n = 67

ϕ WAIS, ϕ périmètre

CBDI \ Route	Échec	Réussite	TOTAL
Échec	10	0	10
Incertain	18	20	38
Réussite	15	48	63

n = 58

Home

Exit

Effets de la non-administration des WAIS-R

C1

CBDI complet

CBDI \ Route	Échec	Réussite	TOTAL
Échec	**9**	0	9
Incertain	13	10	23
Réussite	21	**58**	79

2 1 1 1 3

ϕ WAIS-R

CBDI \ Route	Échec	Réussite	TOTAL
Échec	**7**	0	7
Incertain	15	8	23
Réussite	21	**60**	81

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Exit

Effets de la non-administration de la périmétrie

C1

CBDI complet

CBDI \ Route	Échec	Réussite	TOTAL
Échec	**9**	0	9
Incertain	13	10	23
Réussite	21	**58**	79

3

6

7

ϕ périmètre

CBDI \ Route	Échec	Réussite	TOTAL
Échec	**12**	0	12
Incertain	16	17	33
Réussite	15	**51**	66

Home

Exit

Validité concourante et efficience

ROUTE

CBDI

	échec	réussite
échec	+	-
réussite	-	+

Efficience (Eff)
Proportion d'échecs et réussites correctement prédits par le CBDI

Sensibilité (Sn)
Proportion d'échecs sur la route correctement prédits par le CBDI

Spécificité (Sp)
Proportion de réussites sur la route correctement prédites par le CBDI

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Exit

Validité concourante du CBDI (C1)

	Complet	- P	- W	- W- P
Eff	0,721	0,712	0,739	0,685
Sn	0,512	0,651	0,512	0,651
Sp	0,853	0,750	0,882	0,706

Prédictions INCERTAINES incluses dans les ÉCHECS

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Validité concourante du CBDI (C2)

	-W	-W-P
Eff	0,658	0,592
Sn	0,542	0,583
Sp	0,712	0,596

Prédictions incertaines incluses dans les échecs

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Exit

Résumé

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Exit

Administration intégrale du CBDI

- Efficience: bonne
- Sensibilité : assez faible même lorsque les prédictions incertaines sont incluses avec les prédictions d'échecs
- Spécificité : élevée

Prédictions incertaines incluses dans les échecs

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Exit

Administration *partielle* du CBDI

Il semble que …

- l'administration partielle du CBDI pourrait …
  - modifier ses prédictions (jusqu'à 15% des cas, souvent de façon négative)
  - diminuer son taux de prédictions correctes et augmenter celui des prédictions incertaines
  - diminuer sa spécificité
- le retrait de la périmétrie a un impact plus négatif que celui des Wais-R

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Exit

Limites de l'étude

- Faible nombre et % d'échecs sur la route
- Différences inter-centre sur le plan de l'âge et du % d'échecs sur la route
- C3: biais de sélection des sujets et nombre non significatif d'échecs sur route
- Étude non aveugle
- Hétérogénéité du mode d'administration du CBDI d'un établissement à l'autre

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Conclusion 1

Même lorsqu'il est administré intégralement,
le CBDI semble démontrer une faible sensibilité
en regard du test sur route
habituellement utilisé au Québec
auprès d'une clientèle ayant un AVC ou un TCC.
De ce fait, le recours au CBDI
devrait constituer
un *complément*
et non une substitution
au test sur la route,
et les résultats devraient
être interprétés avec précautions.

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Conclusion 2

Afin d'optimiser sa spécificité
et son taux de prédictions correctes,
le CBDI devrait être
administré intégralement.

L'intégration des mesures de périmétrie
est particulièrement importante.

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Orientations futures

1. **Vérifier l'influence de l'âge et du diagnostic sur la validité concourante du CBDI**
2. **Vérifier la validité concourante du CBDI administré intégralement, dans des conditions plus homogènes et contrôlées**
   - Test sur la route normalisé et identique d'un centre à l'autre
   - Évaluation sur la route à l'aveugle
   - Absence de pré-sélection favorable des sujets

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Exit

Remerciements

- Réseau provincial de recherche en adaptation-réadaptation (REPAR), pour la subvention accordée pour l'embauche d'un étudiant d'été
- Louise Leduc, préposée aux archives, CRCL
- Jacques Audet, agent de recherche, CRLB
- Hélène Bergeron, coordonnatrice de la recherche, CRLB

The International Classification of Functioning, Disability and Health (ICF): Considerations for the Driving Rehabilitation Specialist

Brenda H. Vrkljan
University of Western Ontario (London, Ontario)

Abstract

Purpose/Objective: The ICF (WHO, 2001) provides a conceptual framework and unified language that is used for classifying human functioning and disability. As a classification tool, third party payers and government agencies may use the ICF to evaluate therapeutic services. Therefore, it becomes vital that driving rehabilitation specialists understand the basis of the ICF, including its direct application. The purpose of this paper is to: 1) provide an overview of the ICF, including its theoretical foundations and classification system; 2) demonstrate how the ICF can be used to classify driving-related issues; and 3) discuss implications for using this model in clinical practice.

The International Classification of Functioning, Disability and Health (ICF): Considerations for the Driving Rehabilitation Specialist

... continued

Method: A review of the allied health literature revealed a paucity of information related to the ICF and its applicability to driving rehabilitation. As a result, a case study was conducted to examine the utility of the ICF framework in this practice area.

Results/Findings: For driving rehabilitation specialists, the ICF offers three components in conducting driver evaluations: 1) identification of person factors; 2) consideration of contextual issues; and 3) a unified coding system. The ICF framework targets the identification of limitations related to the person as well as contextual dimensions, such as vehicle design, that influence driving performance. In particular, the ICF coding system may ensure a unified approach with respect to driver assessment and intervention protocols.

Conclusions/Implications: The ICF offers a comprehensive framework for evaluating individuals with driving-related issues. Driving rehabilitation specialists should consider this framework in their development of standards of best practice for conducting driver evaluations.

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The International Classification of Functioning, Disability and Health (ICF):

Considerations for the Driving Rehabilitation Specialist

Brenda Vrkljan, O.T. Reg. (Ont.), Ph.D. Candidate

Dr. Jan Miller Polgar, O.T. Reg. (Ont.), Ph.D.

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Presentation Outline

- The ICF: An Introduction
  - –Aims of the ICF
  - –Key Terms: 'Functioning and Disability'
- A Conceptual Model
  - How does 'Driving' fit within the model?
- A Case Example: 'Mr. K'
  - Coding and Classification System
- The ICF: Implications for Driving Rehabilitation
- Conclusion

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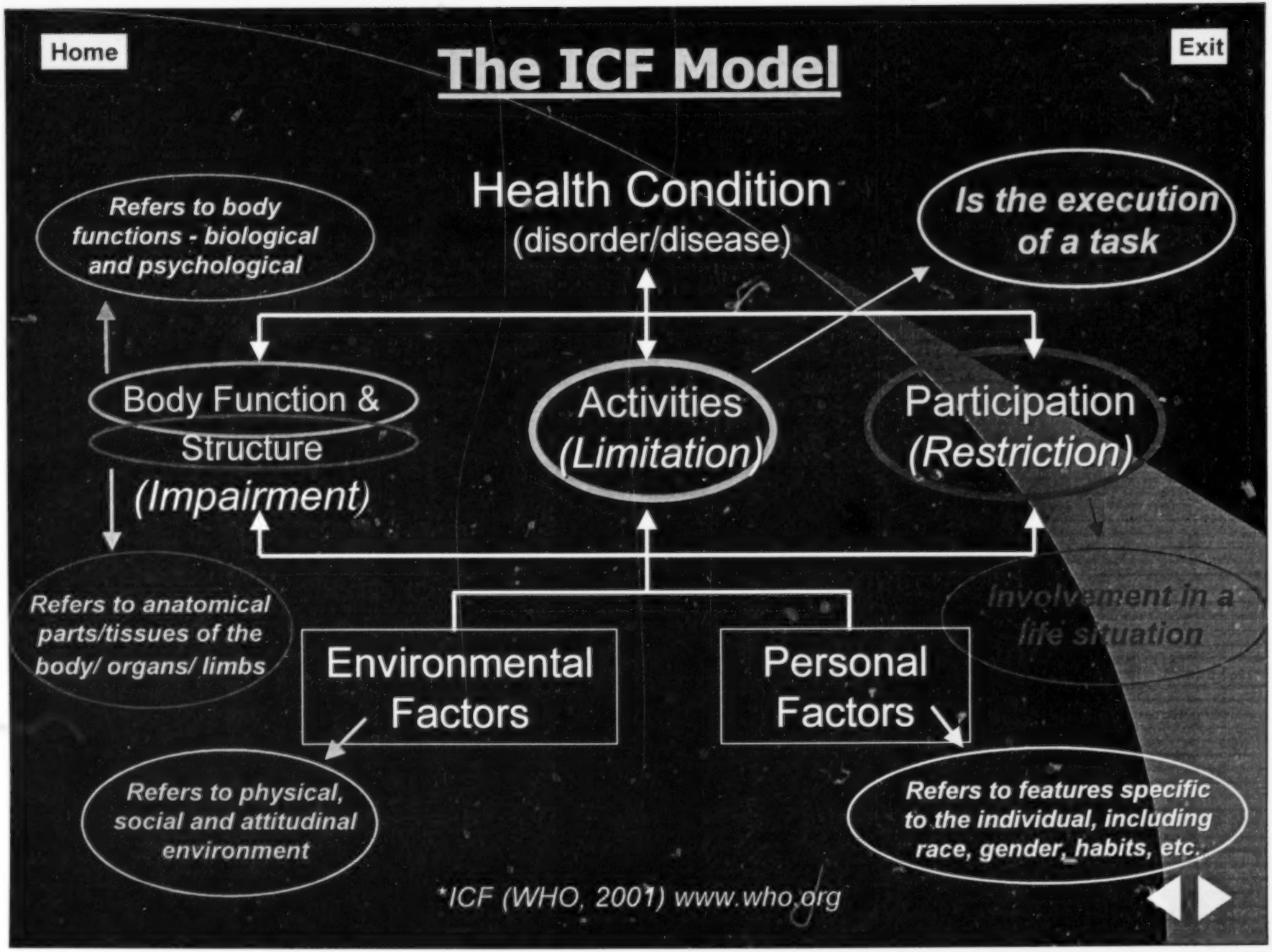
Aims of the ICF

- to provide *a **scientific basis*** for consequences of health conditions
- to establish a ***common language*** to improve communications
- to permit ***comparison of data*** across:
  - countries
  - health care disciplines
  - services
  - time
- to provide a ***systematic coding scheme*** for health information systems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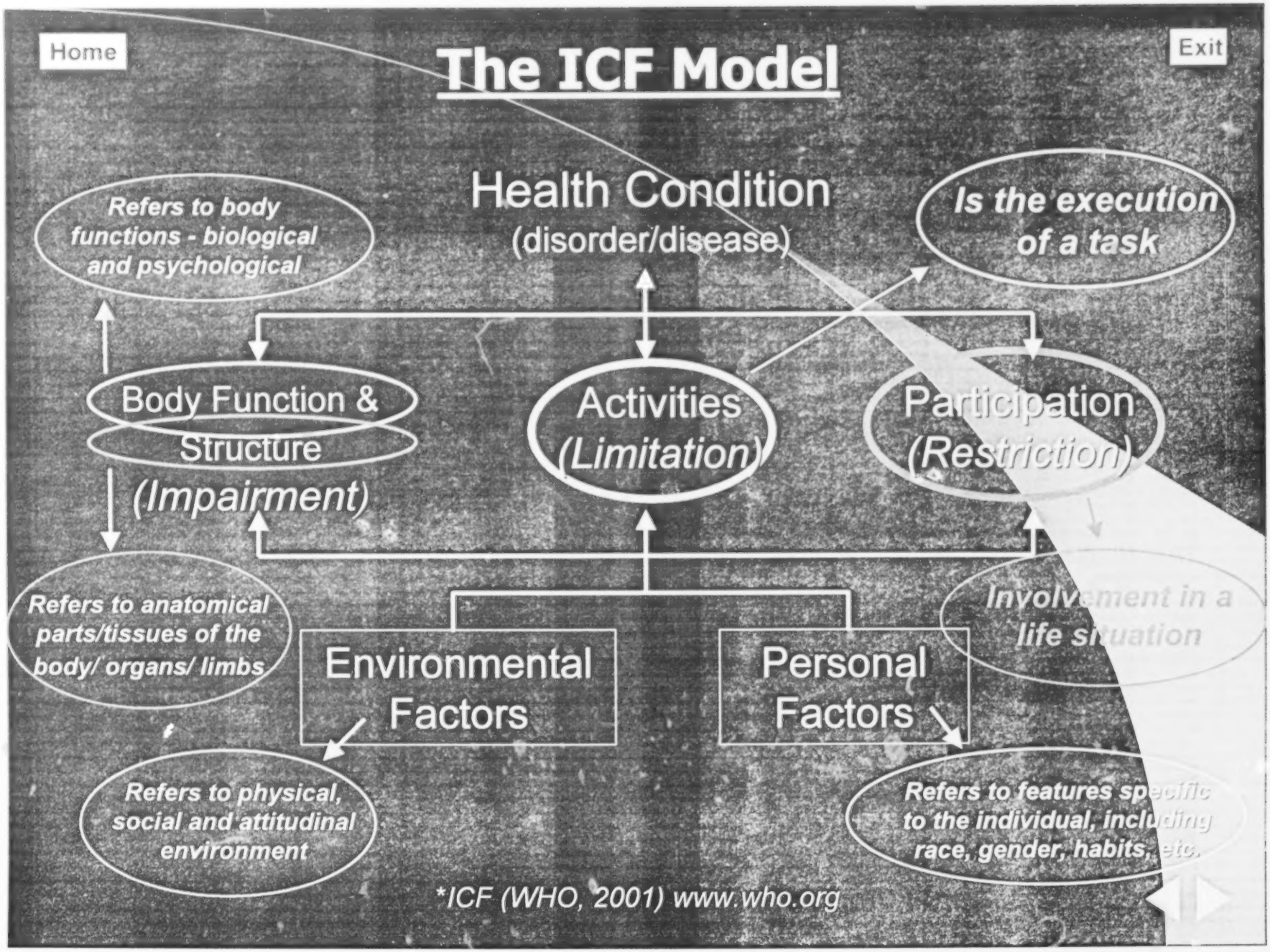
The ICF Model
Health Condition
(disorder/disease)
Refers to body functions - biological and psychological
Is the execution of a task
Body Function & Structure
(Impairment)
Activities
(Limitation)
Participation
(Restriction)
Refers to anatomical parts/tissues of the body/ organs/ limbs
Involvement in a life situation
Environmental Factors
Personal Factors
Refers to physical, social and attitudinal environment
Refers to features specific to the individual, including race, gender, habits, etc.
*ICF (WHO, 2001) www.who.org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*ICF (WHO, 2001) www.who.org

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The ICF Model: Key Terms

Functioning and Disability

'Umbrella terms'

- Used to describe the outcome of the interaction between:

Health-Related Dimensions	Contextual factors
- Body structures, etc.	- Personal factors
- Activity/Participation	- Environmental factors

- ***Functioning*** = positive term for body functions, body structures, activities and participation
- ***Disability*** = negative term for impairments, activity limitations, and participation restrictions

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The 'ICF' Classification System

ICF

Classification

Part 1:
Functioning
and Disability

Part 2:
Contextual
Factors

Parts

Body
Functions
and Structures

Activities and
Participation

Environmental
Factors

Personal
Factors

Components

Home

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Body Functions & Body Structures

Mental Functions	Structures of the nervous system
Sensory Functions and Pain	The eye, ear, and related structures
Voice and Speech Functions	Structures involved in voice and speech
Functions of the cardiovascular, haematological, immunological and respiratory systems	Structures of the cardiovascular, immunological and respiratory systems
Functions of the digestive, metabolic and endocrine systems	Structures related to the digestive, metabolic and endocrine systems
Genitourinary and reproductive functions	Structures of the genitourinary and reproductive systems
Neuromusculoskeletal and movement-related functions	Structures related to movement
Functions of the skin and related structures	Skin and related structures

Home

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Body Functions & Body Structures

Chap. 1: Mental Functions	Chap. 1: Structures of the nervous system
Global Mental Functions (b110-b139) • Consciousness functions (b110) • Orientation functions (b114) • Etc. *Specific Mental Functions* (b140-b189) • Attention (b140) • Memory (b144) • Etc.	• Structure of the brain (s110) • Spinal cord and related structures (s120) • Structure of meninges (s130) • Structure of sympathetic nervous system (s140) • Etc.

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Activity & Participation Domains

1. **Learning & Applying Knowledge** (e.g., watching, copying)
2. **General Tasks and Demands** (e.g., handling stress)
3. **Communication** (e.g., receiving/producing speech, conversation)
4. **Mobility** (e.g., changing body position, carrying, DRIVING)
5. **Self-care** (e.g., washing oneself, dressing, eating, etc.)
6. **Domestic Life** (e.g., acquiring a place to live/goods/services, meal prep)
7. **Interpersonal Interactions & Relationships**
   (e.g., respect and warmth in relationships, relating to strangers)
8. **Major Life Areas** (e.g., education, work/employment)
9. **Community, Social & Civic Life** (e.g., recreation, spirituality)

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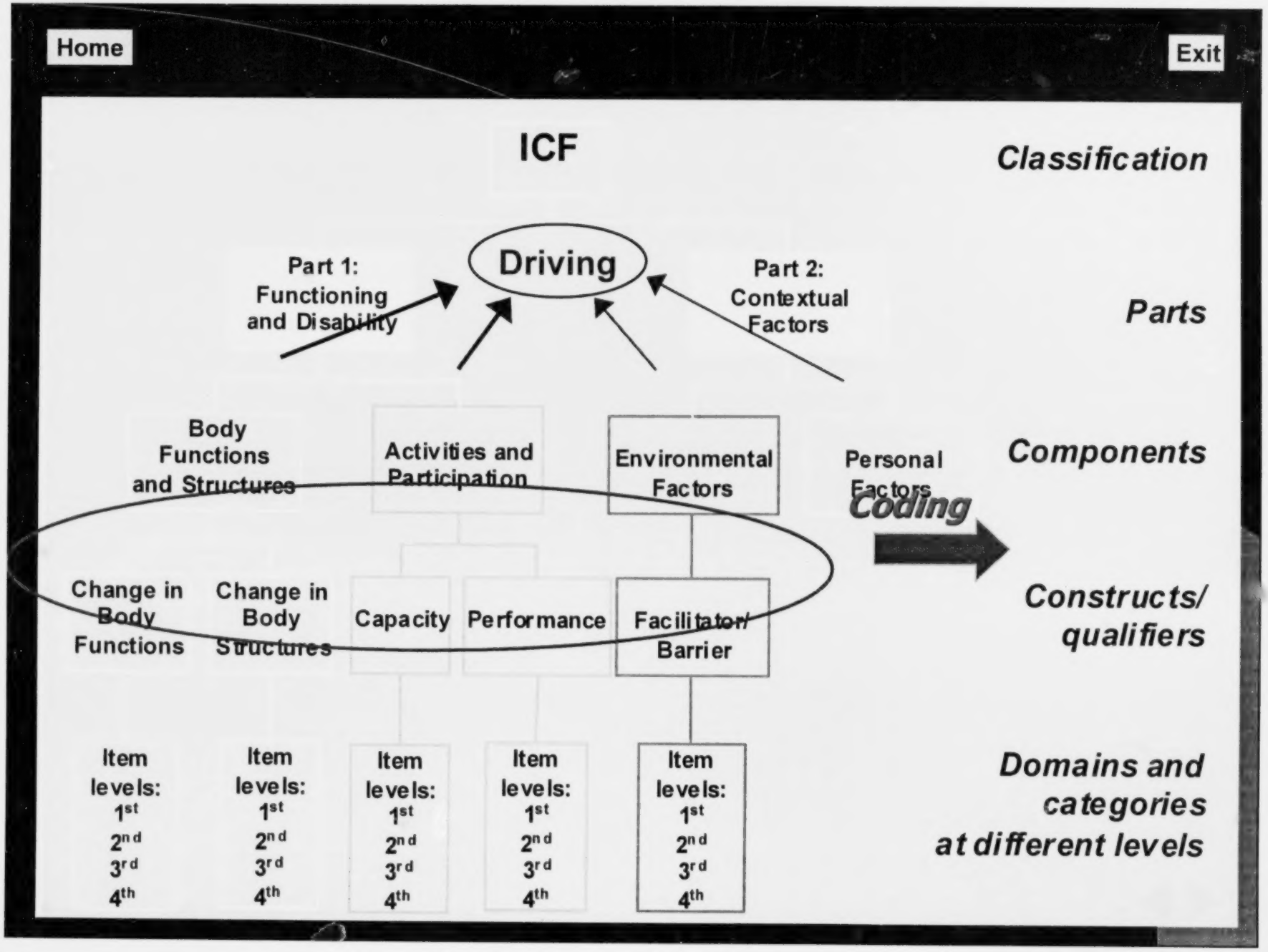
Environmental Factors

1. **Products and Technology**
   (e.g., products & technology for personal indoor/outdoor mobility & transportation)
2. **Natural Environment and Human-Made Changes to Environment**
   (e.g., physical geography, population, climate, light, sound, vibration, air quality)
3. **Support and Relationships**
   (e.g., immediate family, extended family friends, peers, colleagues)
4. **Attitudes**
   (e.g., individual attitudes of family members, friends, societal attitudes, etc.)
5. **Services, Systems and Policies**
   (e.g., Transportation services, systems, and policies)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ICF
Classification
Driving
Part 1:
Functioning
and Disability
Part 2:
Contextual
Factors
Parts
Body
Functions
and Structures
Activities and
Participation
Environmental
Factors
Personal
Factors
Components
Coding
Change in
Body
Functions
Change in
Body
Structures
Capacity
Performance
Facilitator/
Barrier
Constructs/
qualifiers
Item
levels:
1st
2nd
3rd
4th
Item
levels:
1st
2nd
3rd
4th
Item
levels:
1st
2nd
3rd
4th
Item
levels:
1st
2nd
3rd
4th
Item
levels:
1st
2nd
3rd
4th
Domains and
categories
at different levels

Home

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The ICF:

'A Coding and Classification System'

A Case Example: Mr. 'K'

Mr. K had a stroke that resulted in right-sided hemiparesis that affected the muscles in the lower part of his right leg. As a result, he cannot perform the movements required to drive a standard automobile. With suitable modifications to his vehicle, Mr. K can safely drive his car. However, there is a law in his province that prohibits him from driving until he passes an in-vehicle road test.

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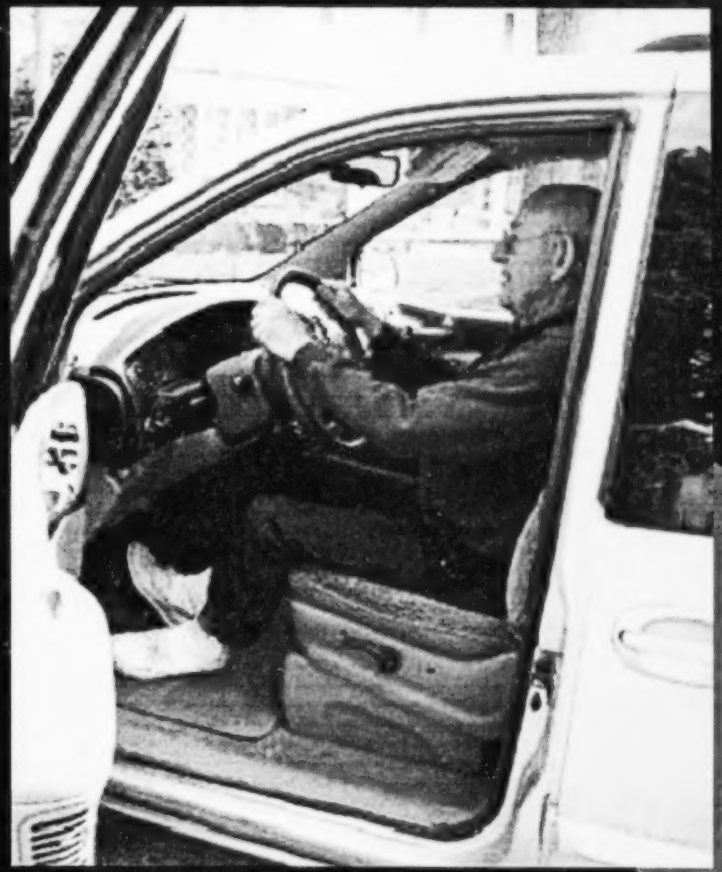
The ICF 'Classification' System

- **Body Functions (b)**

Generic Qualifier	0	No problem
	1	Mild problem
	2	Moderate problem
	3	Severe problem
	4	Complete problem
	8	Not Specified
	9	Not applicable



- **Body Structures**
  - Extent of Impairment (Scale: 0-4, 8, 9)
  - Nature of Impairment (Scale: 0-7, 8, 9)
  - Location of Impairment (Scale: 0-7, 8, 9)

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The ICF 'Classification' System

Exit

" Impairment of a person with hemiparesis with moderate impairment in the power of muscles of lower leg on right side of body "

- Body Functions (b)

chapter/domain — *1st Qualifier*

b7302.2

component — *Second level category*

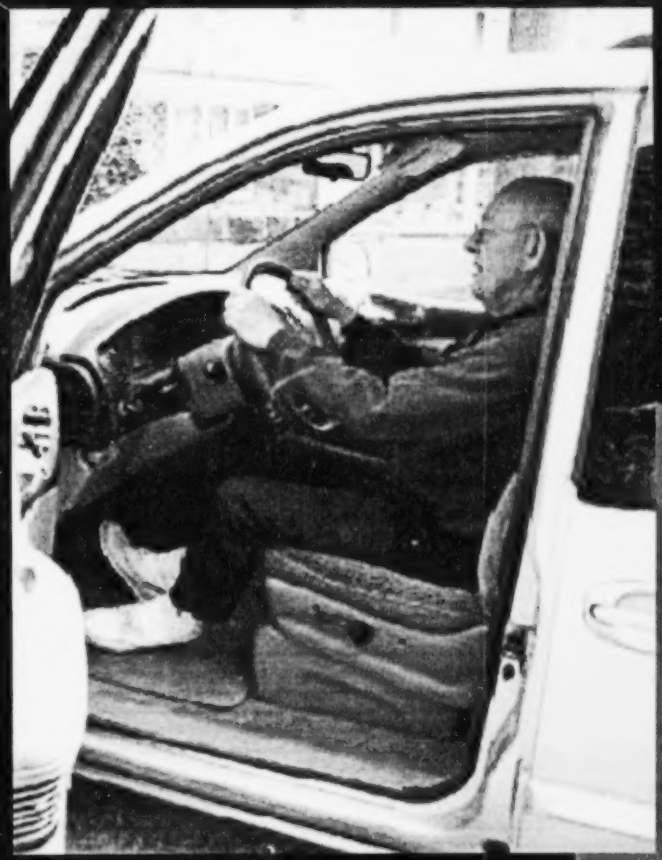
- Body Structures (s)

2nd Qualifier (Nature)

s75012.202

3rd Qualifier (Location)

Second level category



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The ICF 'Classification' System

Exit

" Impairment of a person with hemiparesis with moderate impairment in the power of muscles of lower leg on right side of body "

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component — *Second level category*

- Body Structures (s)

2nd Qualifier (Nature)

s75012.202

3rd Qualifier (Location)

Second level category

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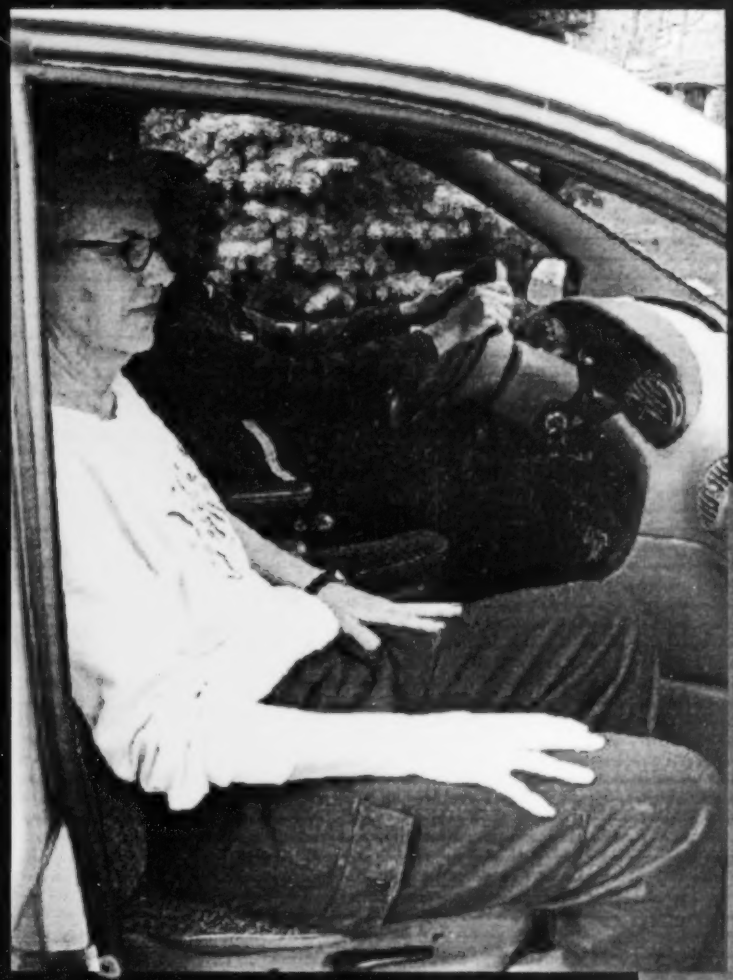
The ICF 'Classification' System

- Activities & Participation

  Qualifiers: Capacity & Performance

  - **Capacity** – with/without assistance
    - Describes an individual's ability to execute a task or action.
    - Indicates the highest probable level of functioning in a given domain at a given moment in a 'standardized' environment.
  - **Performance** – with/without assistance
    - Describes what an individual does in his or her current environment
    - the "lived experience"



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The ICF 'Classification' System

. Activities (a) & Participation (p) or Combined (d):

[Scale 0 - 4 - mild to severe difficulty; 8 Not Specified; 9 Not Applicable]

"Driving" - mild difficulty (in performance of activity in modified vehicle)

d475.0

Performance Qualifier (with assistance)

Capacity Qualifier (w/out assistance)

Capacity Qualifier (with assistance)

Performance Qualifier (w/out assistance)

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The ICF 'Classification' System

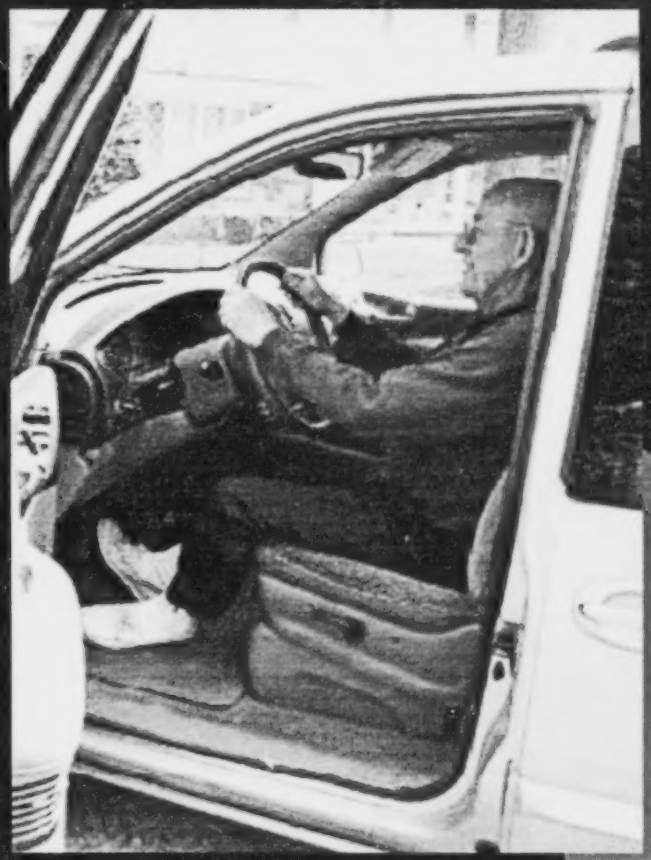
- Environmental Factors (e)

Qualifiers: Barrier vs. Facilitator (+ve)

0 No Barrier/Facilitator

-1 Mild barrier	+1 Mild Facilitator
-2 Moderate barrier	+2 Mod Facilitator
-3 Severe barrier	+3 Substantial Facil..
-4 Complete barrier	+4 Complete Facilit..
-8 Barrier, not specified	+8 Facilitator, not sp..

9 Not applicable



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The ICF: Coding Environmental factors

Mr. K requires modifications to his vehicle.

Law that prohibits Mr. K from driving until he passes road test.

e1201+4 - *Products for personal mobility/transportation – complete facilitator*

e5401-2 - *Transportation services, systems and policies – moderate barrier*

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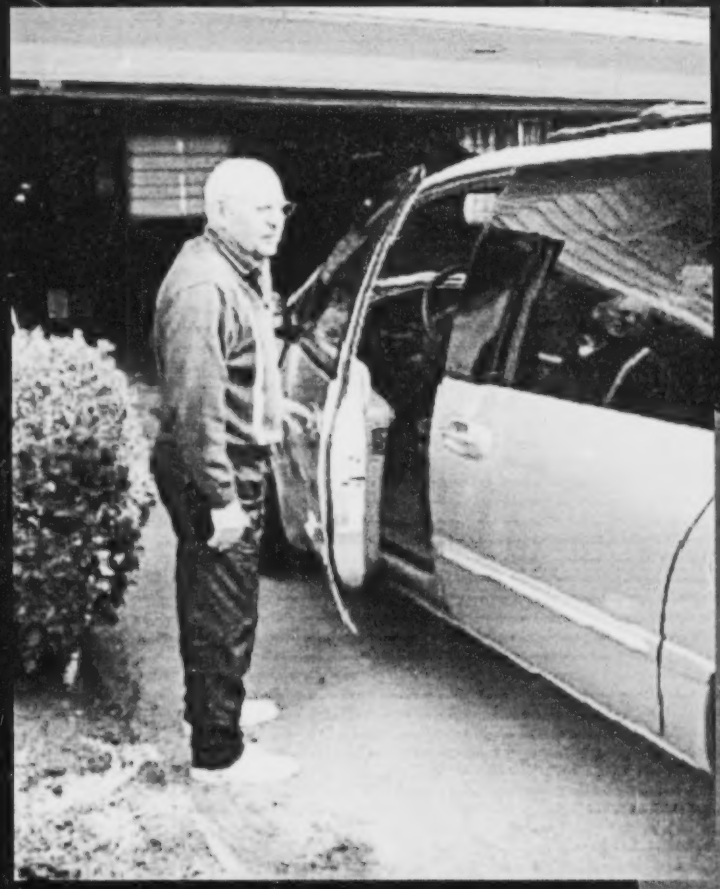
The ICF:

'A Coding and Classification System'

A Case Example: Mr. 'K'

Mr. K had a stroke that resulted in right-sided hemiparesis that affected the muscles in the lower part of his right leg. As a result, he cannot perform the movements required to drive a standard automobile. With suitable modifications to his vehicle, Mr. K can safely drive his car. However, there is a law in his province that prohibits him from driving until he passes an in-vehicle driving test.



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The ICF:

'A Coding and Classification System'

A Case Example: Mr. 'K'

b7302.2

s75012.202

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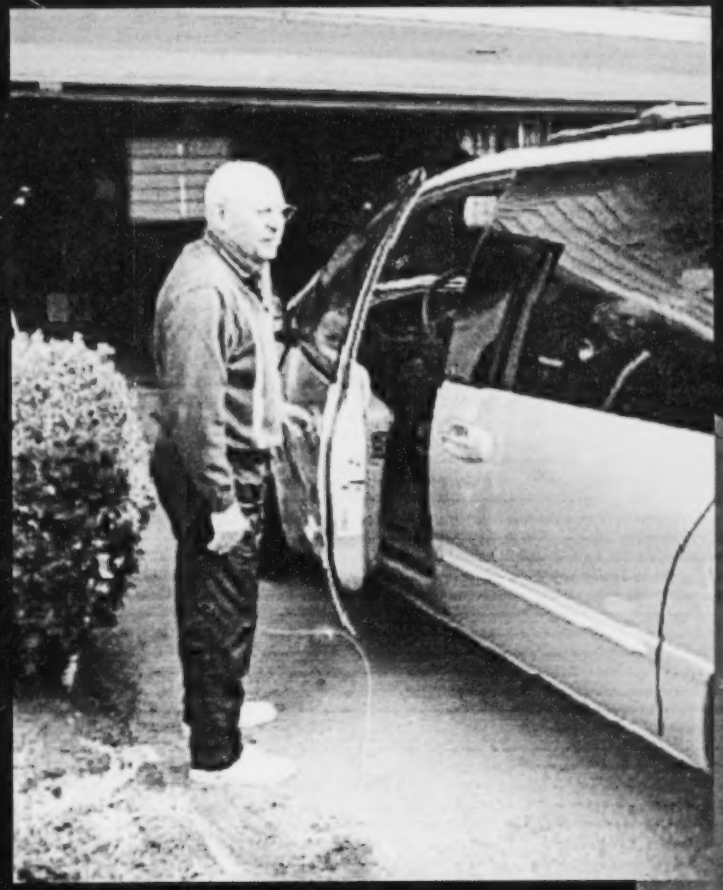
e1201+4

e5401-2



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The ICF: Potential Implications for Driving Rehabilitation Services

- Provides a ***systematic coding scheme*** to collect health information
  - Provides a 'common language,' which may improve communications among service providers, private industry, and government agencies
    - ➢ Collect data on particular cases (e.g., b7032)
  - Permits 'comparison of data' across different countries, services, time periods, etc.

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Conclusion

As driving rehabilitation looks to the future...

ICF

Assessing Metacognition – A Structured Interview Format

Sue Reil
Community Therapists Inc. (Vancouver, British Columbia)

Abstract

Purpose: Metacognition includes two aspects that are interrelated: knowledge concerning one's own cognitive processes and capacities, and the ability to monitor one's own performance. Inaccurate perception of the nature of the task and its level of difficulty can lead to inability to initiate or choose appropriate task strategies (*from Toglia (1991) Generalization of Treatment: A Multicontext Approach to Cognitive Perceptual Impairment in Adults with Brain Injury;* The American Journal of Occupational Therapy; *June 1991, Vol. 45, No. 6*).

Occupational therapists conducting driver assessments both in-clinic and on-road require reliable methods of assessing metacognition as a determinant of their clients' ability to compensate for skills deficits and,

in turn, their potential to benefit from driver rehabilitation. The purpose of this study is to review the essential elements of the structured interview format used to assess metacognition, and to present the results of such testing.

Method: The metacognition interview format is presented and the method of assessing metacognition, both in-clinic and on-road, is reviewed.

Results/Findings: A qualitative review of 20 files presents the metacognition findings with respect to on-road performance and the outcomes of a rehabilitation program.

Conclusion: Assessment of metacognition is an essential element of a functional driving evaluation. The elements of assessing cognition are identified and the potential to conduct research using the structured interview format is explored.

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ASSESSING METACOGNITION - A STRUCTURED INTERVIEW FORMAT

6th National Workshop - May 2004

Sue Reil BScOT

Community Therapists Inc.

Vancouver, BC

s.reil@communitytherapists.com

Definition of Awareness

- Driver's understanding of what is happening in the immediate driving situation and
- Driver's awareness of his/her capabilities and limitations
- Is a key ability for safe driving (TBI, CVA, elderly, young)

* T. Ranney 1997

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Metacognition Skills

- Ability to evaluate difficulty of task
- Predict consequences of actions
- Formulate goals or a plan
- Self monitor performance
- Demonstrate self control

* Brown et al 1983

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Prevalence of Awareness Deficits

- 72 % of CVA
- 68 % of Acute Head Injury
  * Tranel 1989
- 50 % CVA at one year post injury
  * Hibbard 1992

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Diagnoses To Assess

- BI - frontal or parietal lobe dysfunction
- CVA - right hemispheric damage
- CVA - left hemispheric - due to denial
- Dementia
- Schizophrenia

Psychological versus Neurological

- Denial
  - A psychological reaction
  - Angry response or over-rationalization to feedback
  - Aware but do not want to confront issue
- Awareness
  - A neurological insult
  - Little or surprised response to feedback
  - Judges abilities based on pre-accident/injury performances so angry when informed should not drive

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Hierarchical Model of Awareness

- Intellectual
  - Basic knowledge of deficits
- Emergent
  - Able to recognize a problem or error when it is occurring
- Anticipatory
  - Aware of problems and can plan strategies
- May also see Implicit Knowledge of Deficit (deny deficits but behaviour suggests knowledge of it)

* Croon, et al. 1989

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AWARENESS
IS NOT ALL OR NONE

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Areas of Intact Awareness

- Basic ADL's - Self Care Tasks
- Retrospective Memory Activities
  - remembering names, daily schedule
- Overt Emotional responses
  - crying or laughter
- Physical function including vision & hearing

* Fleming & Strong, 1999

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Areas with Poor Awareness

- Large Cognitive Component
  - Scheduling daily activities, meeting daily responsibilities, understanding new instructions
- Socioemotional Components
  - Handling arguments, showing affection to others, recognizing when one has said or done something to upset someone
- Instrumental ADL's
  - Preparing meals, managing finances, and DRIVING
- Prospective Memory Items
  - Keeping appointments on time, remembering important things to do

* Fleming & Strong, 1999

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Functional Implications for Driver Rehabilitation

Without awareness the client may be:

- Difficult to engage in assessment or rehabilitation program
- Unable to predict performance so has a perceived loss of control resulting in anxiety or poor motivation that impedes learning
- Unwilling or not feel the need to use compensatory strategies including adapted equipment
- Unable to generalize skills taught in classroom setting or with behind the wheel training

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Functional Implications (cont.)

Without Awareness the client may have:

- Poor detection of errors; carelessness on road
- Maybe aware of errors but does not initiate corrections
- Strategies/skills are of no good as it does not occur to a client to use them
- Chooses activities beyond abilities so unable to self-restrict driving tasks i.e. no night time driving
- Inability to profit from feedback so is not a rehabilitation candidate

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Components of Assessment

- General Awareness
  - reports deficits; impact on function (e.g. driving)
- Prediction of Performance
  - Direction (Accurate, Under, Over)
  - Discrepancy (Magnitude)
- Estimation of Performance
  - Perceives task difficulty
  - Direction (Accurate, Under, Over)
  - Discrepancy (Magnitude)
  - Accurately recalls task demands
- Strategy Use

* Toglia 1996

Prediction Score is a Highly Reliable Measure of Awareness and is Correlated with Severity of Deficit

Toglia 1996

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How to Measure Awareness

- Comparison of self-ratings to:
  - Family member ratings
  - Caregiver ratings
  - Clinician ratings
  - Performance on certain tests
  - Performance on functional tasks
- Clinician's rating of client's accuracy of self-perception

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Functional Driver Evaluation At Community Therapists

Components of Metacognition Assessment

1. Clinic Interview
2. Road Test - Pre-drive Interview
3. Road Test - Post-drive Interview
4. OT Rating - Functional Performance Measure

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Clinic Assessment - Metacognition Interview

General Awareness

- Why are you here today?
- How will these changes affect your ability to drive?
- What will you need to do differently to compensate or help your driving?

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On-Road -Metacognition Interview

Pre-Drive Questions

- General Awareness
  - Have you noticed any changes with….specific deficits?
  - How would you rate your cognition now?
- Predict Performance
  - How well will you do on 30 min road test?

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On-Road - Metacognition Interview

After the Road Tests

- Estimation of Performance
  - How well did you do? How many errors did you make? Describe them....
- Strategies Used (specific, general or none)
- Rating of Overall Skills
  - How would you describe overall skills?
  - What, if anything, would assist you to improve driving skills?
  - Would you pass the ICBC (government) road test?

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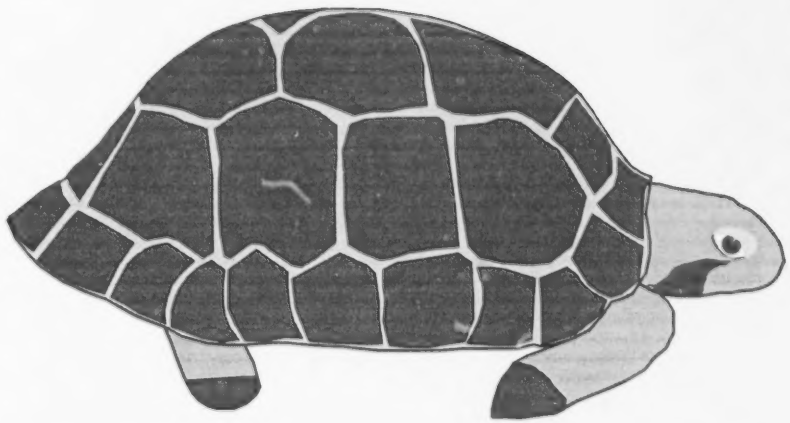
Compensatory strategy use



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Functional Performance Measure
OT Rating - Awareness

1. Does not acknowledge obvious deficits
2. Acknowledges deficits but no appreciation for impact on driving
3. Describes primary deficits but either minimizes or exaggerates effect on driving
4. Accurately describes deficits but unable to identify compensatory strategies
5. Accurate with deficits and strategies

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Functional Performance Measure
OT Rating - Adapt Behaviour

1. Unable to accept feedback
2. Able to acknowledge some feedback
3. Able to acknowledge feedback but unable to alter driving behaviours
4. Able to acknowledge feedback and alter some driving behaviours
5. Able to acknowledge feedback and alter driving behaviours

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Case Reviews

- 23 clients
- Age range between 16 – 82 years
- Diagnoses
  - TBI
  - Dementia
  - CVA
  - Vision

Metacognition Assessment Results

- 7 Passed Functional Driving Evaluation
  - 6 passed Metacognition Assessments (MA)
  - 1 passed in clinic but failed on-road MA
    - aggressive driver
- 7 Rehab Recommended
  - 5 who passed rehab initially passed the MA
  - 2 who failed rehab initially failed the MA

Results (cont.)

- 9 Failed the Functional Driver Evaluation
  - 6 did not proceed to on-road
  - 3 completed the on-road test
- All 9 failed Metacognition Assessment

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Initial Findings

The Metacognition Assessment is Predictive of the Outcome of the Functional Driver Evaluation

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Recommendations for Research

- Increase the sample size
- Look at individual diagnosis and age categories
- Determine cut offs based on model of awareness (Intellectual, Emergent, and Anticipatory)
- Improve language to ensure consistency between raters

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QUESTIONS

Assessing Scanning – A Dynamic Approach

Lisa Kristalovich
Community Therapists Inc. (Vancouver, British Columbia)

Abstract

Purpose: Clients with visual field deficits or visual inattention are at risk for collisions when they do not adequately scan and hence monitor the constantly changing driving environment.

Occupational therapists conducting driver assessments in-clinic prior to going on-road require reliable methods of assessing scanning. The purpose of this study is to review the essential elements of a dynamic scanning assessment.

Method: Dynamic scanning theory, search patterns and strategies, as well as the assessment methodology of the ScanCourse subtest from the biVABA (Brain Injury Visual Assessment Battery for Adults), are presented and the results of 20 assessments are reviewed.

... continued

Results/Findings: A qualitative review of 20 files presents the dynamic scanning findings with respect to on-road performance and the outcomes of a rehabilitation program.

Conclusion: Assessment of dynamic scanning is an essential element of a functional driving evaluation. The method of assessing dynamic scanning is identified and the potential to conduct research using this method is explored.

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ASSESSING SCANNING - A DYNAMIC APPROACH

6th National Workshop May 2004

Lisa Kristalovich BMR (OT)
Community Therapists Inc
Vancouver, BC

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Driving

"To successfully adapt to the environment, one must be able to keep track of all of the objects in the environment which potentially could provide assistance or harm" (biVABA manual)

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What is Scanning?

"Visual scanning is a product of visual attention; it is the motor expression of the attentional process. Any change in visual attention will be observed as a change in the scanning pattern used for visual search" (biVABA manual)

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Degrees of Scanning

Personal space

Near Extrapersonal Space

Far Extrapersonal Space

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Exit

Standardized Tests of Far Space

- Catherine Bergego Scale
- Semi-structured scale for the Functional Evaluation of Hemi-Inattention in Extra Personal Space
- National Institutes of Health Stroke Scale (NIHSS)

- review presented by Menon & Korner-Bitensky at 2003 CAOT conference

Home

Exit

Non-Standardized Tests of Far Space

- Assessment during ADL
- Unilateral Inattention Battery
- Neglect Questionnaire
- ADL Checklist for Neglect
- Questionnaire for detecting everyday problems in stroke patients
- biVABA subtests
- review presented by Menon & Korner-Bitensky at 2003 CAOT conference

Home

Exit

ScanCourse Description

- 1” tall letters or numbers are placed on 20 index cards (3x5”) or sticky notes
- Cards are distributed down a hallway at varying heights & distances, with even distribution between right and left sides of the hallway
- For consistency, CTI has pre-determined locations of the cards

Home

Exit

ScanCourse Administration

- Client is asked to walk down the hall and read the cards while walking without stopping
- Administrator follows the client and tracks number of cards observed or missed
- CTI has developed recording form for ease of administration

Home

Exit

ScanCourse Scoring

- Number and percentage of cards correctly observed is recorded

- Test manual does not specify a cutoff score
  - CTI has set criteria of 90%
  - 0-2 errors per trial

Home

Exit

Scanning Strategies

- Head turn during scanning
  - critical for clients with visual field deficits to observe full environment
- Anticipatory scanning (eye lead time)
  - viewing environment in advance to allow time to respond to potential hazards
- Consistent sequence
  - research shows visual search is completed in an organized, systematic and efficient pattern
  - scanning an open area, left -to-right strategy is generally used

Home

Exit

Scanning Strategies

- Scanning Speed
  - slow scanning can result in missed information in all areas of the visual field
  - slow intersection scans or during turns can result in vehicles, cyclists entering pathway
- Movement Speed
  - Compensates for slow scanning speed
  - Acceptable within limits on-road (at or 5 km/h below posted speed limits)

Home

Exit

Anticipated On-Road Errors due to Scanning Deficits

- Insufficient scans at intersections
- Inconsistent blindspot checks
- Inability to recognize hazards
- Failure to observe
  - other road users
  - pedestrians
  - road signs
- Failure to yield right of way
- Choosing wrong lane on turns

Home

Exit

Predictive Validity

ScanCourse

	Performance	Pass	Fail	Total
On-Road	Pass	True Positives 7	False Negatives 1	8
	Fail	False Positives 5	True Negatives 7	12
	Total	12	8	20

Home

Exit

Interpretation

- Predictive of failing on-road
- Not predictive for passing on-road

- Useful assessment for screening unsafe drivers in the clinic
- Provides information on strategy use and potential on-road performance errors

Home

Exit

Areas to Research

- Reliability with random card placement
- Inter-rater reliability
- Criteria for pass/fail
  - assessment as designed does not yield pass/fail
- Relation between dynamic scanning and scanning on-road
  - qualitative review presented indicated overall on-road performance and did not differentiate reasons for failure

CanDRIVE

Malcolm Hing, Shawn Marshall
CanDRIVE (Ottawa, Ontario)

Abstract

Given that a multitude of physical and cognitive impairments that affect the ability to drive also increase with age, it is not surprising that older drivers experience one of the highest crash rates per mile driven of any age group. For many individuals with disability, the ability to drive permits continuation of independent community living. However, as much as it is desirable to promote the independence of such individuals, the safety implications of driving from an individual and societal perspective require careful consideration. Additionally, legislation in many provinces obligates physicians to notify authorities of persons whom they deem unfit to operate a motor vehicle. Yet, despite this responsibility, they have little empiric information upon which to base these decisions.

This presentation focusses on understanding the research, policy and clinical practice issues related to senior driver involvement in motor vehicle crashes. Highlights include:

1. Delineating the scope of the issue with specific focus on stroke and dementia,
2. Highlighting the research gaps,
3. Describing CanDRIVE, a national collaborative, multi-disciplinary health-related research program dedicated to identifying, analyzing and addressing issues pertaining to the safe operation of motor vehicles in older (65 years and older) persons, and
4. Outlining possible future research directions.

Home

Exit

CanDRIVE

Funded by the Canadian Institutes of Health Research Institute of Aging

May 29, 2004 – 6th National Workshop for Driver Rehabilitation Specialists

Home

Exit

Case #1

- 78 year old male diagnosed with Alzheimer's type dementia 2002 (Neurology)
- Recent (2004) MMSE 24/30
- Feb 2004 Neuropsychology testing
  - Impaired spatial abilities
  - Impaired short term memory
  - Decreased complex visual sequencing
  - Decreased visual learning and memory

Home

Exit

Case #1

- Past Medical History
  - Angina
  - Osteoarthritis
- Medications
  - Aricept
  - Cardizem
  - Enteric Coated Aspirin
  - Nitroglycerin patch
  - Occasional benzodiazepines

Home

Exit

Case #1

- Driving History
  - Active license
  - Family members have expressed concerns regarding driving ability
  - No crash involvement history (self report)
  - Retired policemen who would be devastated if he lost his license

Home

Exit

Case #1

- In-House Evaluation
  - Normal physical examination
  - Difficulty dividing attention
  - Difficulty following instructions
  - Charron test 10 errors (up to 3 allowed)
  - Unable to complete Trail Making test B
  - Limited insight into cognitive abilities
- Doron Simulator Evaluation
  - Slow response to hazards
  - Mental fatigue evident

Home

Exit

Case #1

- On-Road Evaluation:
  - September 2003
  - Poor Shoulder checking
  - Passed- but re-test recommended (due to insecurity of results)
  - November 2003
  - Passed, same result
  - April 2004
  - Passed, same result

Home

Exit

Case #1

- Highlights the:
  - The important lifestyle ramifications of loss of license
  - The heavy burden on those legally responsible for evaluating driver fitness
  - The need for an evidence-based approach

Home

Exit

Overview

- Background
- Clinician Responsibilities
- Current Issues related to the Older Driver
- Driving and Dementia
- The CanDRIVE Research Program
  - Research
  - Legal/Legislative/Policy Initiatives
  - Educational Initiatives
- Are older drivers taking over the road?

Home

Exit

Background

Driving is:

- a complex task requiring both physical and mental integrity
- extremely important for health, independence & self esteem
- however, safety issues remain paramount

Home

Exit

Background

- Older drivers
  - fastest growing segment of licensed population
  - vast majority continue to be safe to drive
  - often unfairly characterized by the media

Home

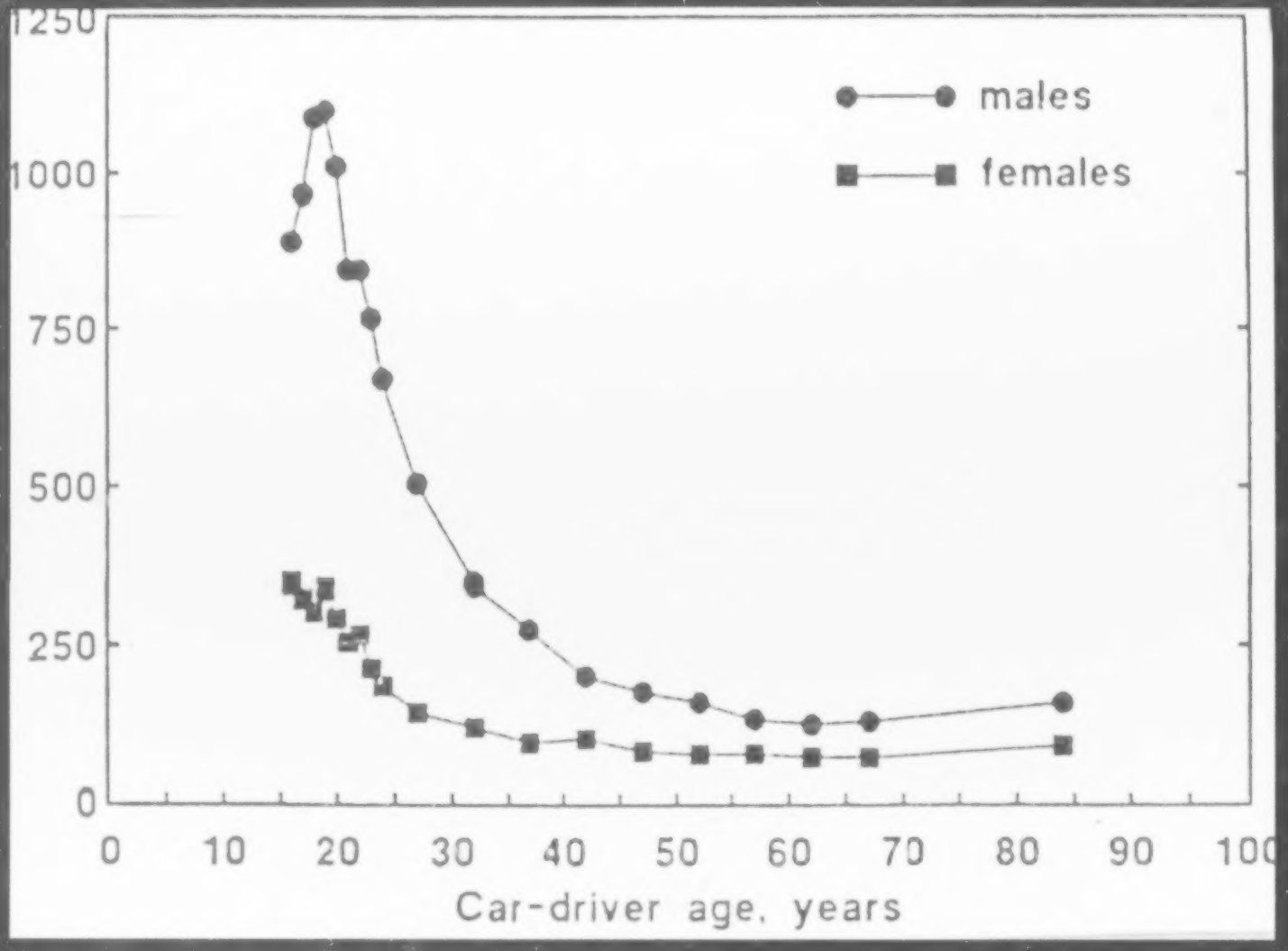
Exit

Background

- Are crash rates amongst older drivers a serious problem?
  - Depends on your perspective.

Home

Exit


1250
1000
750
500
250
0
0
10
20
30
40
50
60
70
80
90
100
Car-driver age, years
males
females

Home

Exit

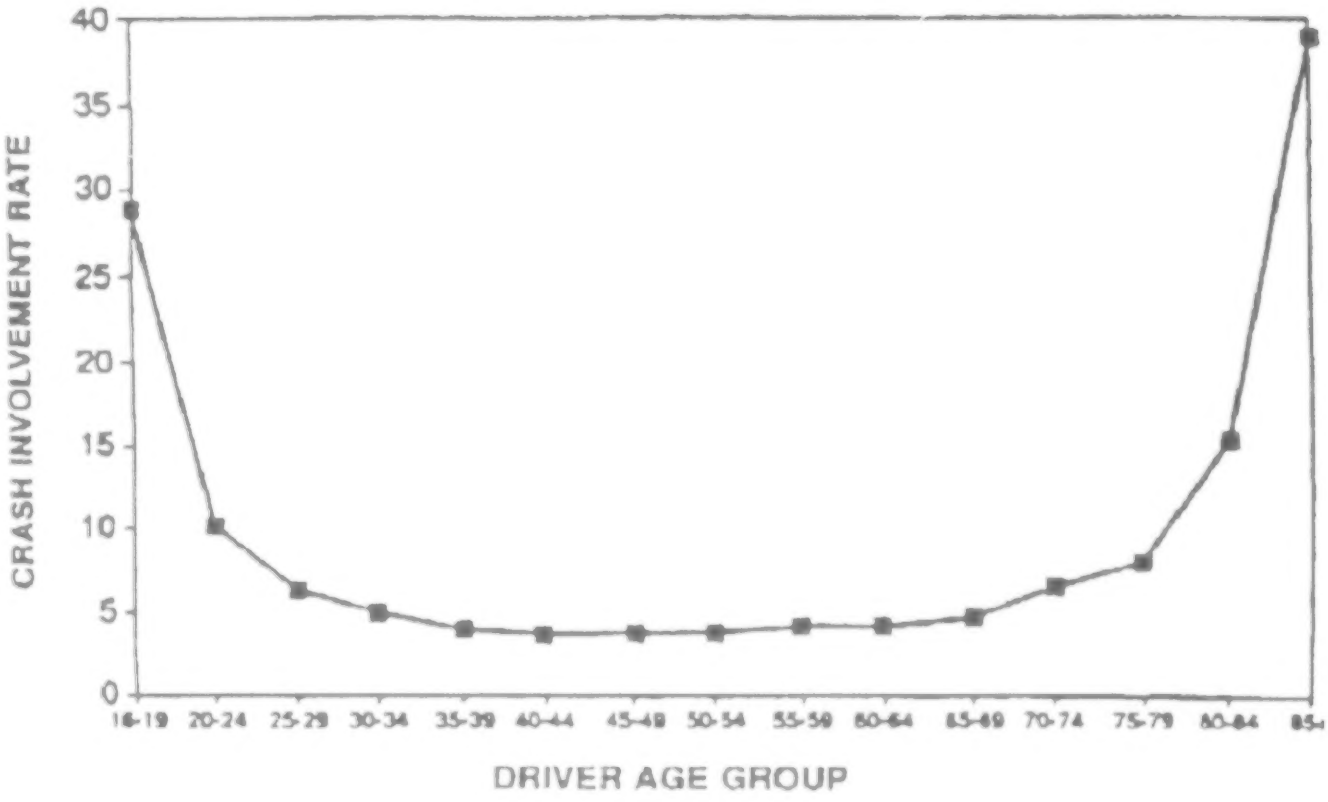


Figure 2. Rate of Motor vehicle crashes adjusted for miles driven according to driver's age. SOURCE: Cerrelli E. *Older Drivers: The Age Factor in Traffic Safety.* Washington, DC: US Department of Transportation, National Highway Traffic Safety Administration, 1989

Home

Exit

Background

- Are crash rates amongst older drivers a serious problem?
  - Societal perspective
    - No, as older drivers are not over-represented in crashes
  - Individual perspective
    - Yes, as once on the road, much more likely to be involved in a crash

Home

Exit

Background

- Older drivers
  - high crash rate per miles driven (though not the highest)
  - crash for different reasons than younger persons
  - involved in different types of crashes
  - once involved in a crash - highest mortality and morbidity of any age group

Home

Exit

CanDRIVE

- Why do older persons have relatively high crash rates?
  - not “age” in itself
  - the increasing prevalence of medical and functional conditions that affect driving ability

Home

Exit

Driving and Medical Conditions

- Numerous conditions associated with crashes:
  - Medical
    - Stroke
    - Seizure (first reported in 1906)
    - Cardiovascular
    - Visual
    - Diabetes
    - Dementia
  - Functional limitations

- Prevalence of these conditions increases with age

Home

Exit

Driving in Older Persons

- Previous literature
  - Inappropriately focused on:
    - presence /absence of disease
    - age as a factor in crashes
    - age-based restriction on licensing
  - Often do not recognize that the vast majority of older persons remain safe to drive

Home

Exit

Driving in older persons

- More appropriate focus for research
  - extending the safe driving period for all drivers
  - older drivers with medical and functional impairments
  - lessening the impact of driving cessation in those who must stop

Home

Exit

Driving in older persons

- Different regulatory standards across the country
  - – often age-based
- Health professionals in most provinces
  - legally responsible for reporting unsafe drivers

Home

Exit

Reporting Duties

Province	Obligation to Report	Protection
British Columbia	Mandatory	Yes (recent)
Alberta	Discretion	Yes
Saskatchewan	Mandatory	Yes
Manitoba	Mandatory	Yes
Ontario	Mandatory	Yes
Quebec	Discretion	Yes
New Brunswick	Mandatory	Yes
Prince Edward Island	Mandatory	Yes
Nova Scotia	Discretion	Yes
Newfoundland	Mandatory	Yes
Yukon Territory	Mandatory	Yes
North West Territory	Mandatory	Yes

Home

Exit

CanDRIVE

- Little guidance for clinicians
  - lack of empiric based standards
    - e.g. Canadian Medical Association guidelines suggests “full evaluation” if MMSE <24

Home

Exit

Major Older Driver Issues

- Self restriction/cessation
- Primary level screening
- Specialized testing
- Acceptable level of risk
- Technological innovation
- Restricted licensing
- Retraining programs/refresher courses
- Impact of driving cessation
- Driving and Dementia

Home

Exit

Older Driver Issues

- Self restriction/cessation
  - Determinants
  - Prevention of "inappropriate" self restriction/cessation
  - Development of a conceptual framework

Home

Exit

Older Driver Issues

- Primary level screening
  - Screening tool development
    - Consensus vs scientifically-based
    - Point of application
    - Clinically sensible and friendly
  - Current professional practice
  - Compilation of condition-specific risk factors

Home

Exit

Driving in older persons

- Comprehensive Driving Evaluation
  - Too expensive and labor intensive to be applied to all drivers
- Should a screening test be applied to older drivers?
  - With those who fail screen going on to CDE

Home

Exit

Identifying Unsafe Drivers

Multiple organizations and task forces have called for a reliable and valid method to identify older drivers who are medically unfit to drive

- 1988 TRB Special Report 218
- 1999 CCMTA Maturing Driver Workshop Proceedings and Aging Driver Strategy.
- 2001 OECD Report: Ageing and Transport: Mobility Needs and Safety Issues
- 2002 Ontario Coroner's Report: Elizabeth Kidnie death

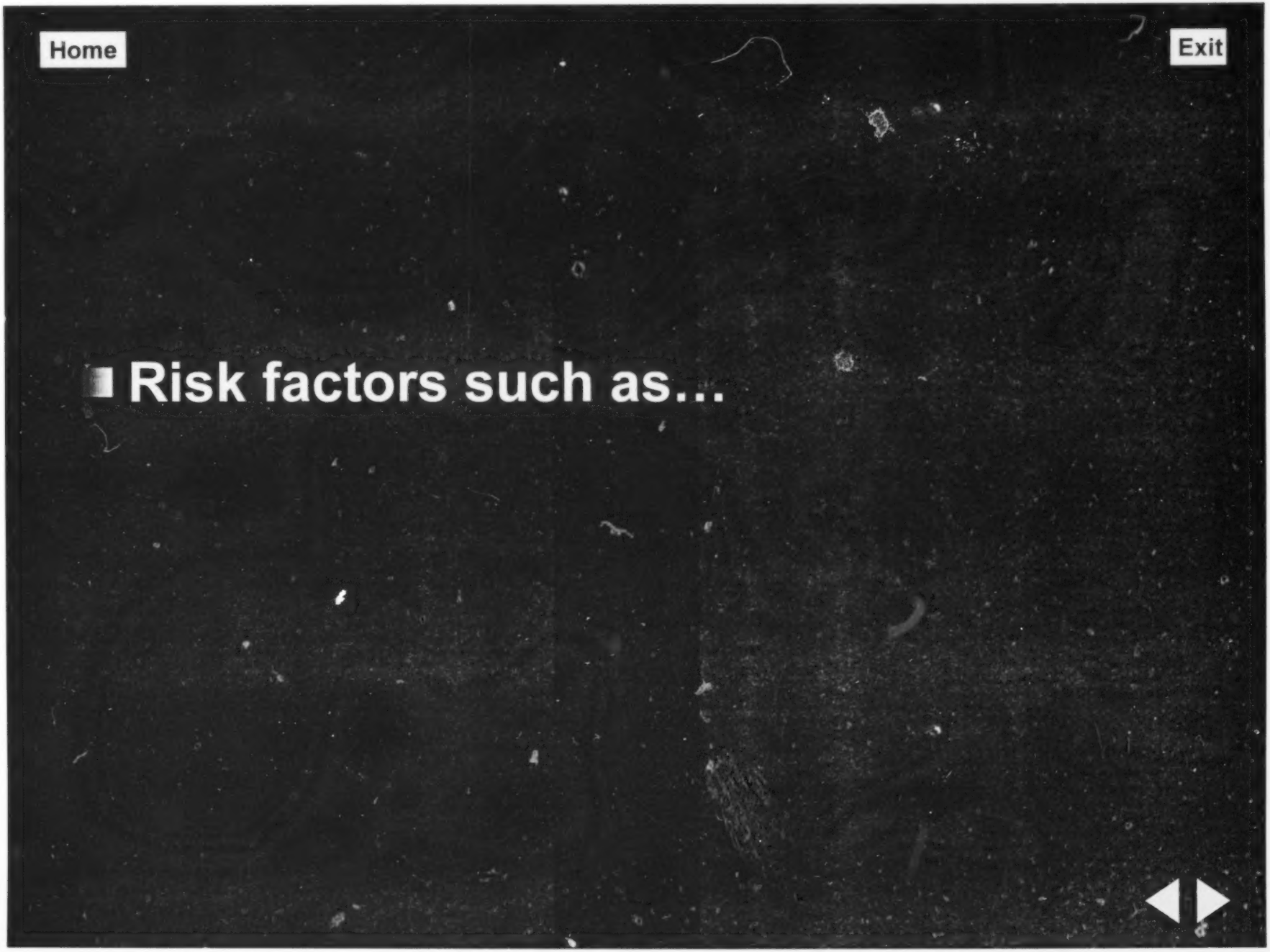
Home

Exit

Driving in Older Persons

Clear need for:

- a screening tool that will help clinicians identify persons with medical and functional impairments who are at increased risk of involvement in motor vehicle crashes


Home
Exit
Risk factors such as…

"What's the big idea sticking this on the back wall of the garage?"

Home

Exit

Older Driver Issues

- Specialized testing
  - Standardization of protocols
  - Validation versus crashes
  - Current professional practice

Home

Exit

Older Driver Issues

- Acceptable level of risk
  - Crash rate (absolute and per mile driven) lower than teenage drivers
  - What level of crash risk is society willing to accept?

Home

Exit

Older Driver Issues

- Technological innovation
  - Efficacy of:
    - Navigation systems
    - Early warning systems
    - On-screen displays

Home

Exit

Older Driver Issues

- Restricted licensing
  - Effectiveness
  - Acceptability of different types

Home

Exit

Older Driver Issues

- Retraining programs/refresher courses
  - Types
  - Effectiveness

Home

Exit

Older Driver Issues

- Impact of driving cessation
  - Support programs
  - Alternate forms of transportation

Home

Exit

Driving and Dementia

- 30% of persons aged >80 have dementia
  - clearly impacts ability to drive
  - not all are unsafe to drive
  - of drivers >80 years old renewing their licenses - 20% have cognitive impairment

Home

Exit

Driving and Dementia

Examining the Evidence

Home

Exit

Dementia and Driving

- Clinically Relevant Questions
  - Q1. Are all persons with dementia unsafe to drive?

Home

Exit

Dementia and Driving

- Q1. Dementia is not a absolute contraindication to driving.
  - people with mild dementia do not have higher than expected crash rates
    - Carr et al, JAGS 2000
    - Trobe et al, Arch Neurol 1996

Home

Exit

Dementia and Driving

- Q2. If safe, how often should they be tested?
  - 6 month follow-up recommended.
    - L. Hunt, JAGS 1993
      - 50% with mild dementia progress to the next stage within 1 year suggests that driving competence should be tested every 6 months
    - G.K. Fox, JAGS 1997
      - 7 subjects with AD were initially judged safe to drive. 6 months later 4 /7 were no longer safe

Home

Exit

Dementia and Driving

- Q3. What specific factors differentiate persons who are safe to drive versus unsafe?
  - 3 types/levels of studies
    - Retrospective assessment of driving performance
    - Real Time Performance Measures
      - Driving Simulator
      - On-Road Testing
    - Prospective Cohort studies

Home

Exit

Dementia and Driving

- Risk determined retrospectively
  - Patient cognitive/medical characteristics correlated with crashes in the past
  - Obvious limitations
    - recall bias
    - actual presence of conditions at time of crash

Home

Exit

Dementia and Driving

- Risk determined by Performance on Driving Simulator/On-road assessment
  - Patient cognitive/medical characteristics correlated with performance on these tests
  - Limitations
    - Unknown whether performance on these tests is predictive of future crash
    - No assessment of 'strategic' aspects of driving

Home

Exit

Driving and Dementia

Risk determined by Prospective Cohort

- None of the studies focused on dementia.
- 4 prospective cohort studies of driving
  - R.A. Marottoli, Ann Intern Med 1994
  - D.J. Foley, JAGS 1995
  - R.V. Sims, JGerontol 1997
  - K.L. Margolis, J Gerontol 2002

Home

Exit

Driving and Dementia

Prospective Cohort Risk Factors

- mobility (fewer blocks walked, foot problems)
- back pain
- use of anti-inflammatory meds
- use of hypnotic medications
- self-reported stroke / TIA
- orthostatic hypotension
- slow foot reaction time
- difficulty opening jars
- difficulty with yard work or light housework

- Most risk factors derived will not help us in evaluating persons with dementia

Home

Exit

Summary of the Literature

- Limited assistance to clinicians
  - Dementia is not a absolute contraindication to driving
    - Some people with mild dementia can continue to drive safely
  - 6 month follow-up appears justified
    - Planning for non-driver status should begin ASAP even in persons with dementia who are still safe
  - Further research is required to delineate the clinically measurable cognitive factors predicting MVC risk

Home

Exit

When evidence fails we must move to expert consensus opinion

Home

Exit

Dementia and Driving

- Consensus statements
  - Swedish (1997)
  - Australian Geriatrics Society (2001)
  - American Academy of Neurologists (2000)

Home

Exit

Dementia and Driving

- Consensus statements
  - Recognize limitations of data
    - those with moderate to severe dementia should not drive
    - individual assessment for those with mild dementia
    - periodic follow-up is appropriate
    - MMSE cutoffs for severity are not useful

Home

Exit

Driving and Dementia

- Key recommendation
  - "gold standard" is a comprehensive driving (off-road and on-road) evaluation

Home

Exit

Case #2

- 88 year old active (full time) accountant (October, 2003)
- Past Medical History
  - Polio age 3 affecting right upper extremity- not functional
  - Angina
  - Hypertension

Home

Exit

Case #2

- Medications:
  - Enteric Coated Aspirin
  - Norvasc
  - Amiodarone
  - Altace
  - Lasix
  - Lovastatin
  - Tylenol #3

Home

Exit

Case #2

- Driving Status:
  - MTO requested that he have a Neurologist evaluation
  - Mild to moderate short term memory impairment and Non functional right upper extremity noted
  - No collisions or violations reported (self report)
- MMSE:
  - 24/30
  - Wrong season
  - Wrong address
  - 0/3 recall
  - Copying error

Home

Exit

Case #2

- Functional Status
  - Help/supervision with most IADLS (meds, finances)
  - Cueing to bathe/dress appropriately

Home

Exit

Case #2

- In-house Evaluation
  - Right arm non functional
  - Trail making tests A & B at 25th percentile
  - Other visuospatial tests poorly done
  - 0/10 on road sign recognition test
  - Slow information processing
  - Confused
  - Decreased insight
- Simulator Evaluation:
  - Not completed due to
    - Confusion
    - Increasing anger

Home

Exit

Case #2

- On-Road Evaluation:
  - Acceptable steering using a modified shuffle method due to decreased right shoulder function
  - Completed lane changes without checking traffic or signaling
  - Proceeded through intersections without checking for traffic or bicycles or pedestrians
  - Completed left turn in which he followed vehicles ahead and did not check traffic
  - Late in noting hazards ahead and needed to brake suddenly

Home

Exit

Case #2

- On Road Evaluation
  - Turned into incorrect lane and then moved into other lane without checking
  - At times drove too fast for conditions
  - Did not move to right when emergency vehicle approaching
  - Unpredictable Maneuvers
  - Poor overall judgment…

"Don't start looking for your glasses at 80 mph."

Home

Exit

Case #2

- Overall outcome
  - Unsafe to drive

Home

Exit

CanDRIVE

- CIHR-funded infrastructure grant ($1.25 million over 5 years)
  - Investigators
    - Malcolm Man-Son-Hing MD
    - Shawn Marshall MD
    - Frank Molnar MDCM
    - Keith Wilson PhD
    - Ian Graham PhD
    - Ian Stiell MD
    - Larry Chambers PhD
    - Cassandra Crowder MA and Angela Kennedy (Program Managers)
  - A nation-wide network of multi-disciplinary investigators

Home

Exit

CanDRIVE - Vision

To establish a national multidisciplinary collaborative approach to identify, analyze and address the health-related issues pertaining to the safe operation of motor vehicles by older persons with medical and functional impairments

- Work with transportation organizations on Canada's Road Safety Vision 2010

Home

Exit

Bring Together…

- researchers
- seniors groups
- clinicians
- ministries of transportation
- other governmental organizations
- non governmental agencies

Home

Exit

CanDRIVE research members

- BC: H. Tuokko PhD, B.L. Beattie MD, M. Malone MD
- AB: D. Hogan MD, B.Dobbs PhD, A. Dobbs PhD
- MB: M. Porter PhD, P. St. John MD
- ON: J. Polgar PhD, L. Hunt BSc (OT), G. Naglie MD, M. Chipman PhD, A. Byszewski MD, M. Bedard PhD, R. Blair PhD, H. Finestone MD, L.Trick PhD, E.Casson PhD, W. Hogg MD, J. Lindsay PhD,
- PQ: N. Korner-Bitensky PhD, I. Gelinas PhD, M. Vanier PhD, T. Audet PhD, B. Mazer PhD
- NB: Scott Deschenes MSc
- NS: C. MacKnight MD

Home

Exit

CanDRIVE Partnerships

- CARP – Canadian Association of Fifty Plus
- FSNA – Federal Superannuates National Association
- City of Ottawa
- Ontario Ministry of Transportation (formal endorsement)
- CCMTA – Canadian Council of Motor Transportation Administrators (formal endorsement)
- SMARTRISK
- CAA
- Ontario Seniors' Secretariat
- Transportation Injury Research Foundation
- AUTO21
- Ontario Medical Association
- Ontario Safety Council
- Ontario Neurotrauma Foundation

Home

Exit

CanDRIVE - Objectives

- To develop a screening tool that will allow clinicians to identify older persons with health-related reasons that make them unsafe to drive
- To find ways to extend the length of time that persons can drive
  - Retraining programs
  - "Customized" licensing

Home

Exit

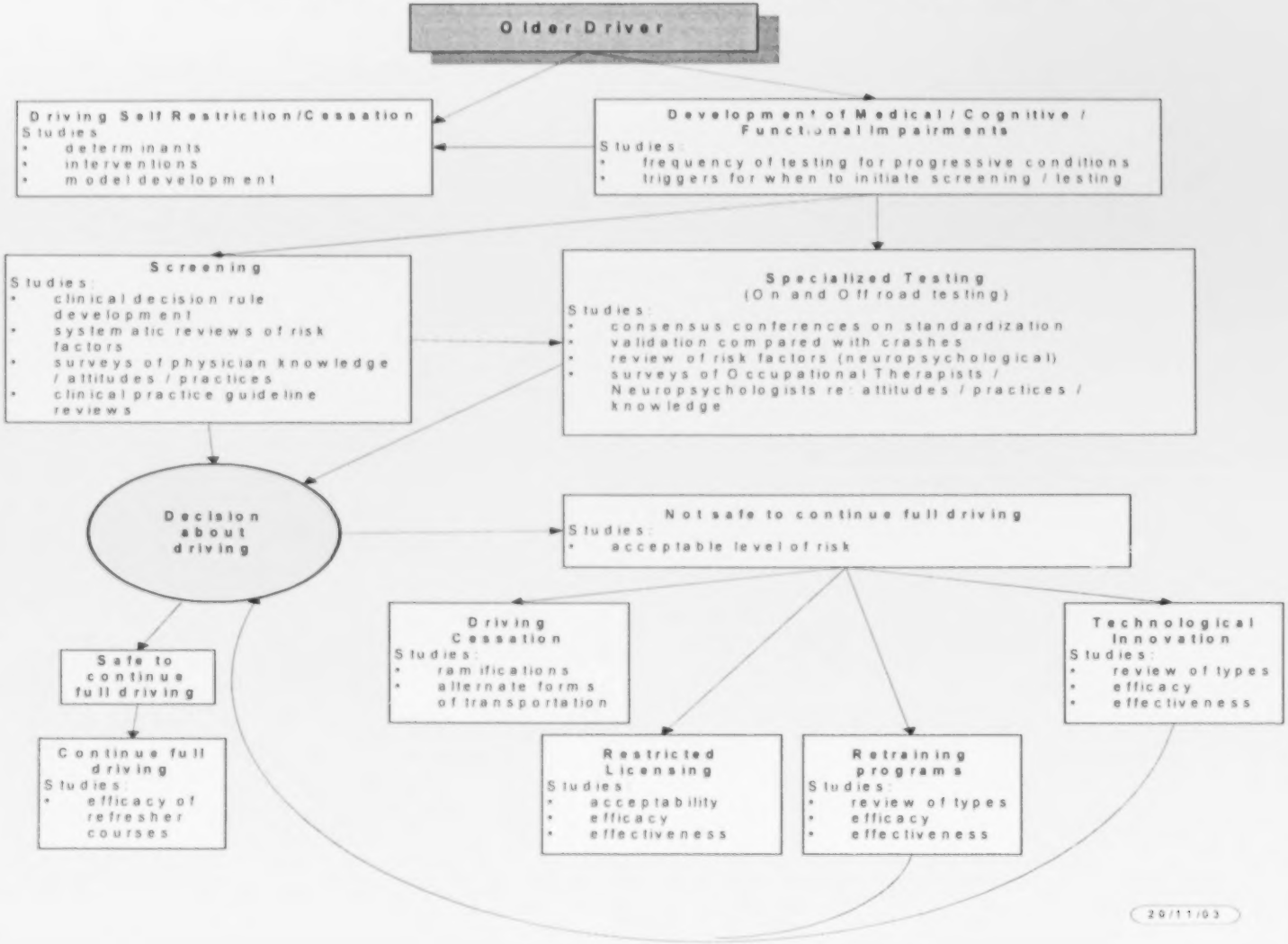
CanDRIVE - Objectives

- To assist physicians in meeting legal reporting requirements where they exist
- To address all health-related aspects (psychosocial, cultural, linguistic, societal, legal, health care resource, political) of ensuring the safety of drivers and others

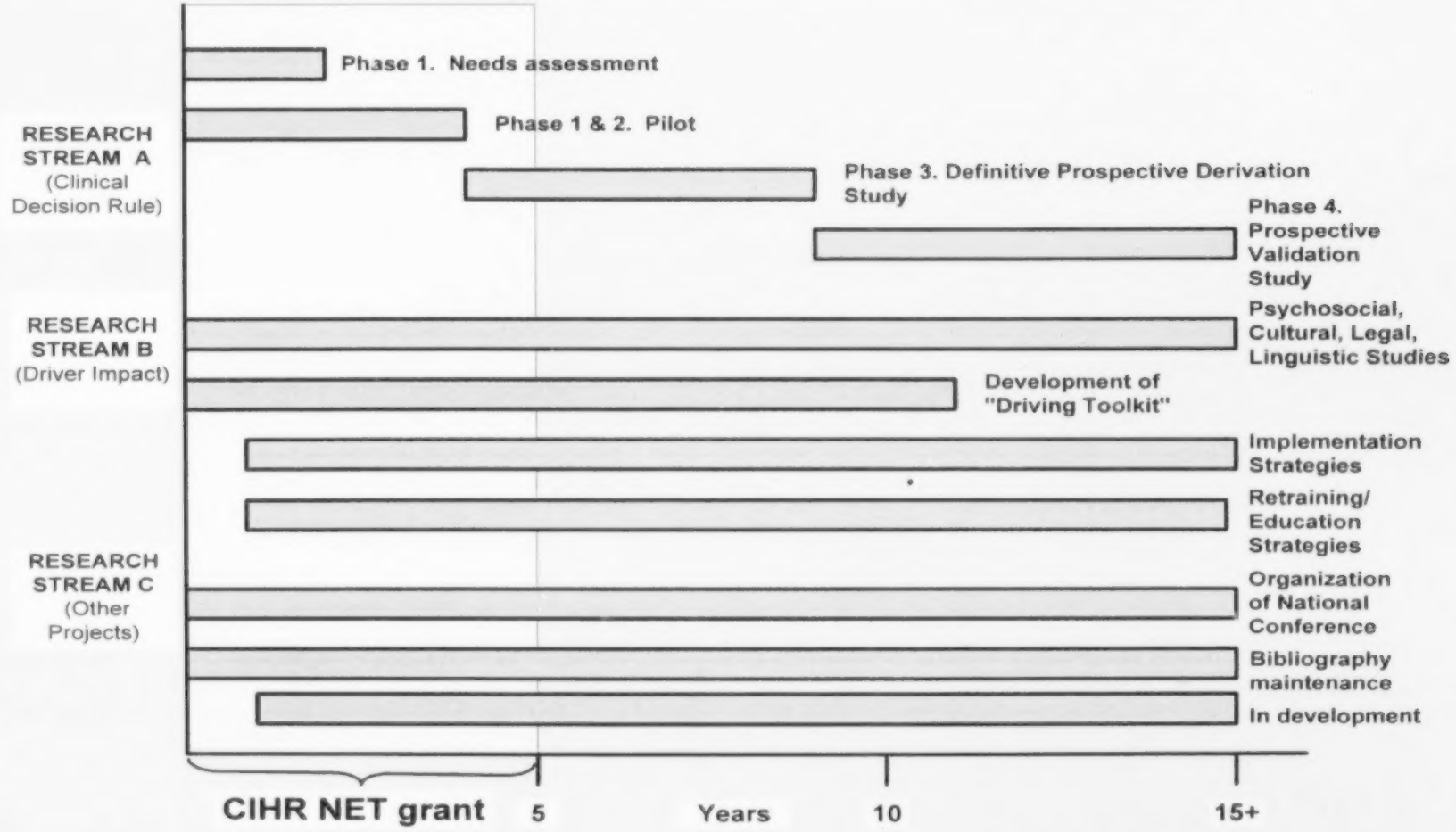
Home

Exit

CanDRIVE Flow Diagram of Older Driver Assessment



Timeline of CanDRIVE Research Projects



Home

Exit

CanDRIVE

- Accomplishments to date:
  - Establishment of a Coordinating office at University of Ottawa Elisabeth Bruyere Research Institute
  - Investigator Retreat Jan 25-26, 2003 in Ottawa
    - research priorities developed including those related to the policy/legal and psychosocial aspects of driving
  - Established driving research database
    - (>1400 articles – hard copies and entered into Reference Manager)
  - Establishment of an Advisory Board

Home

Exit

CanDRIVE

- Accomplishments to date (cont)
  - Formation of multiple formal partnerships
  - Development of website, materials for public and media consumption
  - Recruitment of a researcher for psychosocial aspects of project

Home

Exit

CanDRIVE

- Conducting Research
- Influencing Policy
- Changing Practice

Home

Exit

CanDRIVE

- Conducting Research
  - Funded studies
    - Case-Control ER study
      - Physicians Services Incorporated Foundation ($65,000)
    - RCT of the efficacy of the 55 Alive driver education program
      - AUTO21 ($214,000)
    - Canadian Safe Driving Phase 1 Pilot Study
      - CIHR open competition ($88,000)
    - Test-retest reliability of DriveABLE
      - REPAR ($40,000)
    - The acceptability of restricted licensing and determination of driving exposure through GPS
      - Ontario Neurotrauma Foundation ($100,000)

Home

Exit

CanDRIVE

Prospective Cohort Study:

- Participants
  - Representative sample
  - Age 70 or greater
  - sample size estimated at 2000 to 3000 participants
  - Measure their demographic, medical, functional, neuropsychological and driving characteristics
  - examined annually for 5 years
- Follow to outcomes of crashes, traffic violations and driving cessation (as identified from MoT databases and driving diaries)

- Pilot study: enrollment completed (funding received from CIHR June, 2003)

Home

Exit

CanDRIVE

- Extending the safe driving period
  - Study of retraining programs (MB, JP)
  - Acceptable restricted licensing options
- Understanding and lessening the impact of driving cessation
  - Review of self-restriction
  - Development of programs to prevent "premature" driving cessation (HT, BD)

Home

Exit

Other CanDRIVE research projects

- Systematic reviews
  - risk factors for crashes:
    - dementia
    - stroke
  - Driving self restriction
- Surveys
  - Physicians' knowledge attitudes and practices
  - Professional organization guidelines
- Consensus conference development
  - Comprehensive driving (on and off road) assessment
  - Driving simulator assessment
- Driving cessation utility assessment

Home

Exit

CanDRIVE Bursary Program

- 2003
  - PhD Fellowship, Patrice Lazure
    - Criterion Validity of the Driving Simulator Faros-ErgoDrive
      - Supervisor, Marie Vanier PhD, U of Montreal
  - Pilot Project
    - Test-retest Reliability of DriveABLE
      - Nicol Bitensky PhD, McGill University
  - Summer Studentships
    - Development of an Instrument for Assessing Self-perceptions of Competency for Driving
      - Supervisor, Bonnie Dobbs PhD, U of Alberta
    - Driving exposure using electronic monitoring
      - Supervisor, Michelle Porter PhD, U of Man
    - Everyday Competencies and Older Driver Safety
      - Supervisor, Holly Tuokko PhD, U of Victoria

Home

Exit

CanDRIVE Bursary Program

- 2004
  - MSc Fellowship, D. Benoit
    - Older Drivers' Perceived Workload when Driving Using Adaptive Equipment
      - Supervisor, Isabelle Gelinas PhD, McGill University
  - MSc Fellowship, I. Menard
    - Views, Attitudes, Knowledge and Practices of Psychiatrists Regarding Assessment of Competance Amongst those Using Psychiatirc Medications.
      - Supervisor, Nicol Korner-Bitensky PhD, McGill University

Home

Exit

CanDRIVE Bursary Program

- 2004 summer studentships
  - Development of an instrument for assessing self-perceptions of competency for driving
    - Supervisor, Bonnie Dobbs PhD, U of Alberta
  - Fitness to drive: an exploration of physically active lifestyles and driving competence in older adults
    - Supervisor: Holly Tuokko PhD, University of Victoria
  - Driver distraction with on-board technology
    - Supervisor: Lana Trick PhD, University of Guelph
  - Shoulder and rear checking behaviors
    - Supervisor: Michelle Porter PhD, University of Manitoba

Home

Exit

CanDRIVE publications

- AM Byszewski, ID Graham, S Amos, M Man-Son-Hing, WB Dalziel, S Marshall, L Hunt, C Bush, D Guzman, A continuing medical education initiative for Canadian primary care physicians: the driving and dementia toolkit. JAGS 2003;51:1484-1489.
- S Marshall, R Spasoff, R Nair, C van Walraven. Restricted driver licensing for medical impairments: does it work? CMAJ. 2002;167-170.
- N Azad, A Byszewski, S Amos, FJ Molnar. A survey of the impact of driving cessation in older drivers. Geriatrics Today 2003;5:170-174.
- M Man-Son-Hing, SC Marshall, FJ Molnar, KG Wilson, C Crowder, LW Chambers. Health-related research concerning older drivers: development of a coordinated Canadian interdisciplinary strategy (under review, Geriatrics Today)
- M Man-Son-Hing, SC Marshall, FJ Molnar, KG Wilson, C Crowder, LW Chambers. Development of a coordinated Canadian interdisciplinary strategy for health-related research concerning older drivers (under review, Canadian Journal of Aging)

Home

Exit

CanDRIVE

- Influencing Policy
  - Medical Advisory Committee of the Ministry of Transportation Ontario (SM, MH)
  - CCMTA associate members
    - Routinely invited speakers/participants at CCMTA meetings

Home

Exit

CanDRIVE

- Legal/Legislative/Policy Projects
  - Survey of the attitudes and practices of primary care physicians
  - Review of outcomes related to failing of OT comprehensive driving assessment
  - Determining the “acceptable” level of crash risk
  - Decision analysis of options related to the older driver with mild Alzheimers

Home

Exit

CanDRIVE

- Changing Practice
  - Supporting costs and evaluation of "Driving Toolkit"
    - Publication in J Am Geriatr Soc (Oct, 2003)
  - Numerous workshops/presentations for practicing clinicians
    - Canadian Colloquium on Dementia, October 2003
    - Canadian Geriatrics Society meeting, May 2003
    - Ontario Injury Prevention Conference, Feb 2004
    - OECD International Conference on the Older Driver, September 2003
    - Canadian Injury Prevention Conference, Nov 2003

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Exit

CanDRIVE

- Media Commentary
  - CTV, Global television appearances
  - Radio phone-ins
  - Numerous newspaper interviews/articles
  - Organizational newsletters

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CanDRIVE sustainability

- Need for long term funding
  - National collaborative research projects
    - expected to take 10-15 years for completion
  - funding of NET grant is 5 years

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CanDRIVE

- Possibilities for extended funding
  (~$250,000 per year)
  - Insurance industry (Dr. Frank)
    - IBC
    - Individual companies
  - Automobile industry (Dr. Frise)
    - Manufacturers' association
    - Individual companies
  - SCO Foundation
  - Partnerships with other research groups
    - (e.g. Networks of Centres of Excellence, AUTO21)

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Resources

- Determining Medical Fitness to Drive: A Guide for Physicians. Sixth Edition. (May 2000) www.cma.ca
- Driving and Dementia Tool Kit for Family Physicians (Dementia Network of Ottawa-Carleton) www.rgapottawa.com
- American Medical Association Guide www.ama-assn.org/ama/pub/category/8925.html

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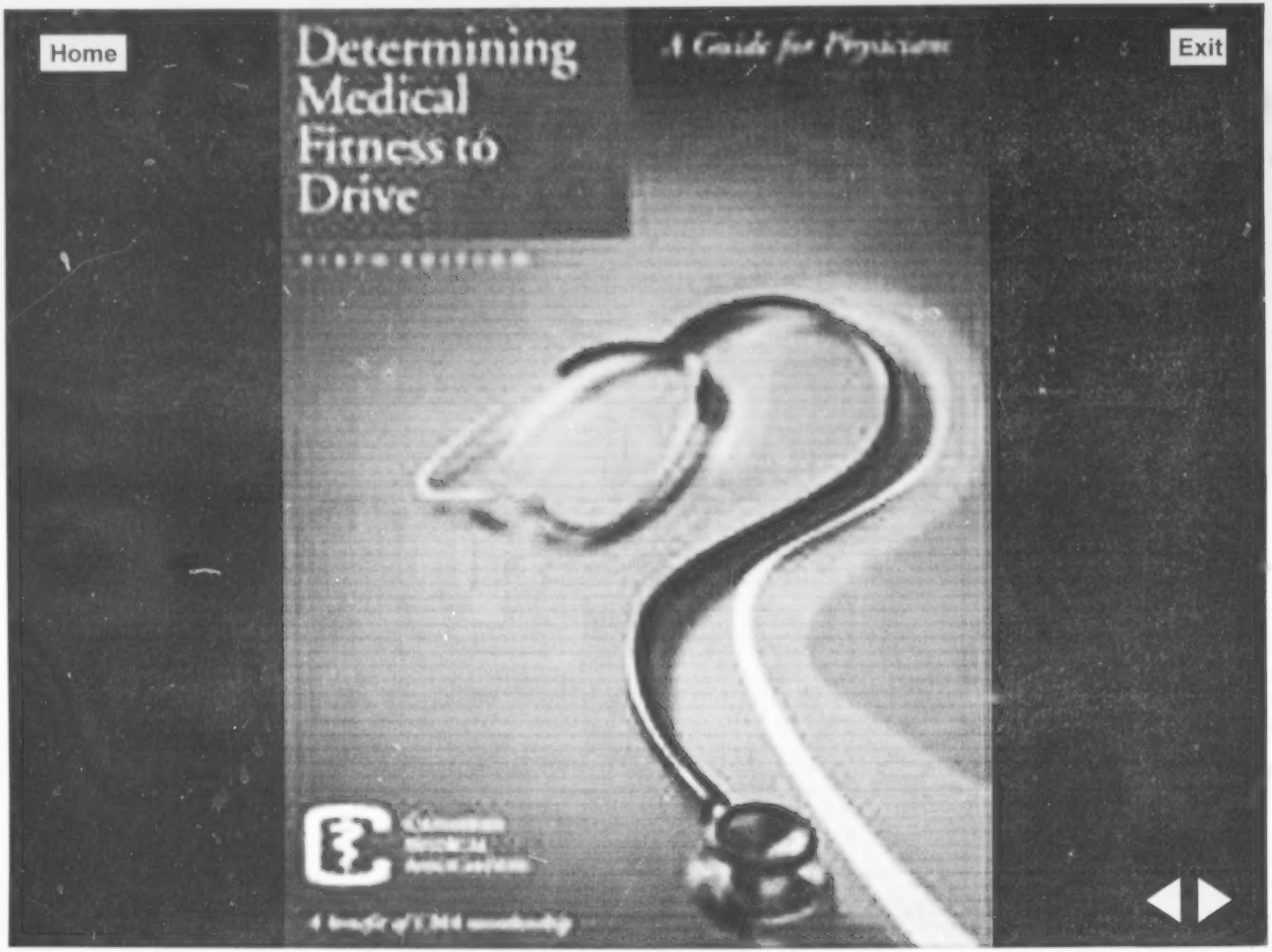
The Driving and Dementia Toolkit

La Conduite Automobile et la Démence: Trousse d'information

The Dementia Network of Ottawa-Carleton

Réseau de la démence d'Ottawa-Carleton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Determining Medical Fitness to Drive
A Guide for Physicians
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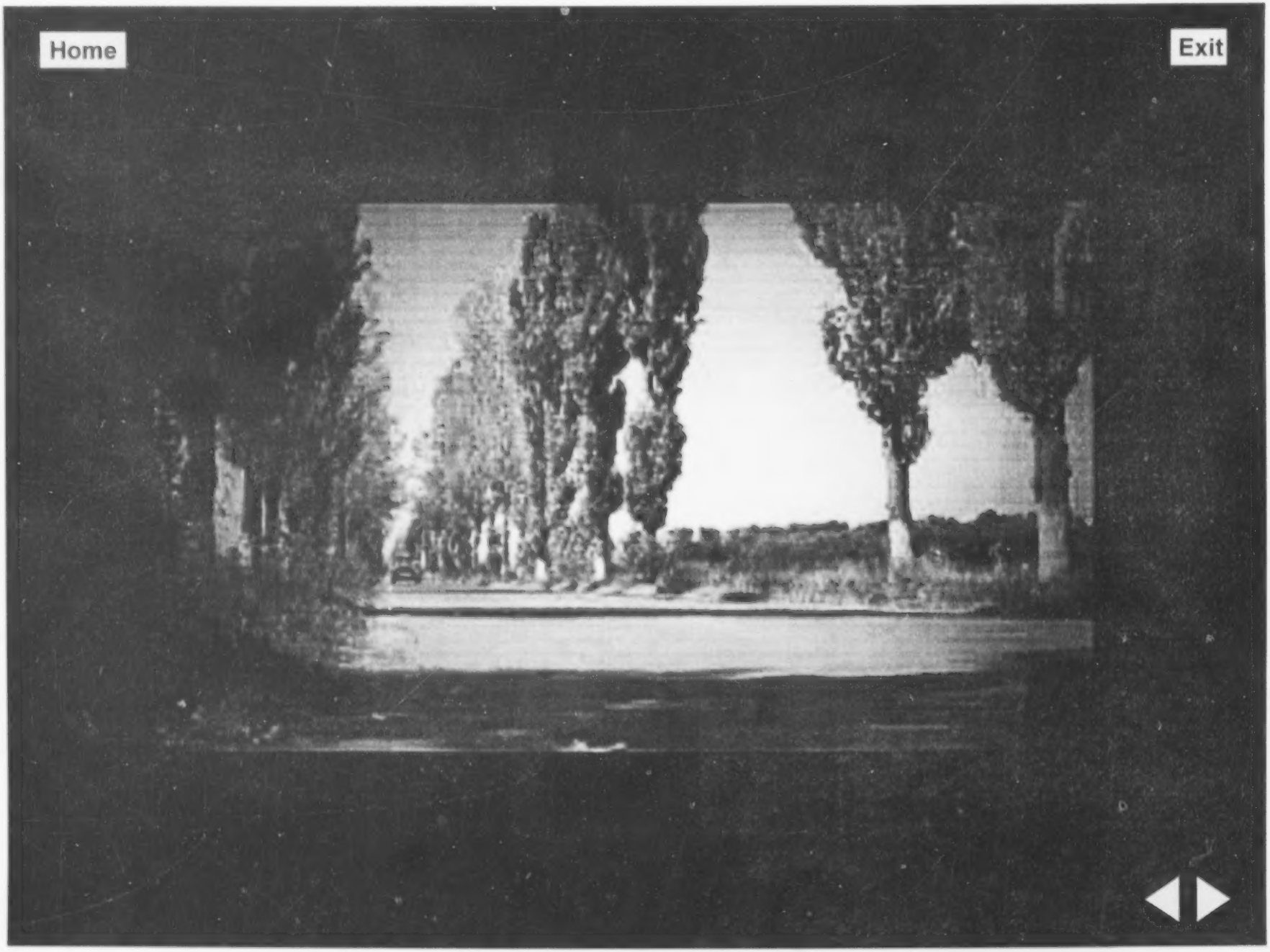
Older drivers

Taking over control of the road?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Thank You!

What Is Required for 'Standardization' in Driver Assessments?

Allen R. Dobbs
University of Alberta (Edmonton, Alberta)

Abstract

Many medical conditions and medications can cause cognitive impairment, and cognitive impairment can seriously impair a person's ability to drive safely. The gold standard of driving competence evaluations for these clients and others is the in-vehicle road test. Determining the elements of an effective road test is a complex matter, and this is often the focus of attention. However, once those elements are determined and a road course is selected to represent those elements, there remains the question of how that road course compares to other road courses having the same elements. This is a critical issue when there is a requirement for standardization across more than one location in a jurisdiction. The approach adopted by DriveABLE is to use an external criterion that is

identical at each location, and against which the difficulty of each course can be measured. Those differences then need to be accommodated. QA procedures to ensure course and assessor effectiveness and calibration also are requisite. The DriveABLE approach to these requirements is presented.

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What is Required for 'Standardization' in Driver Assessments?

Allen R. Dobbs, PhD
President & Chairman
DriveABLE Assessment Centres Inc

6th National Workshop for Driver Rehabilitation Specialists,

Edmonton, May 29 2004

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The DriveABLE Assessment

In-Office Assessment

Individual testing
Guided by Assessor (practice given)
Touch screen/button push responding
Age normed performance
Validated predictive accuracy

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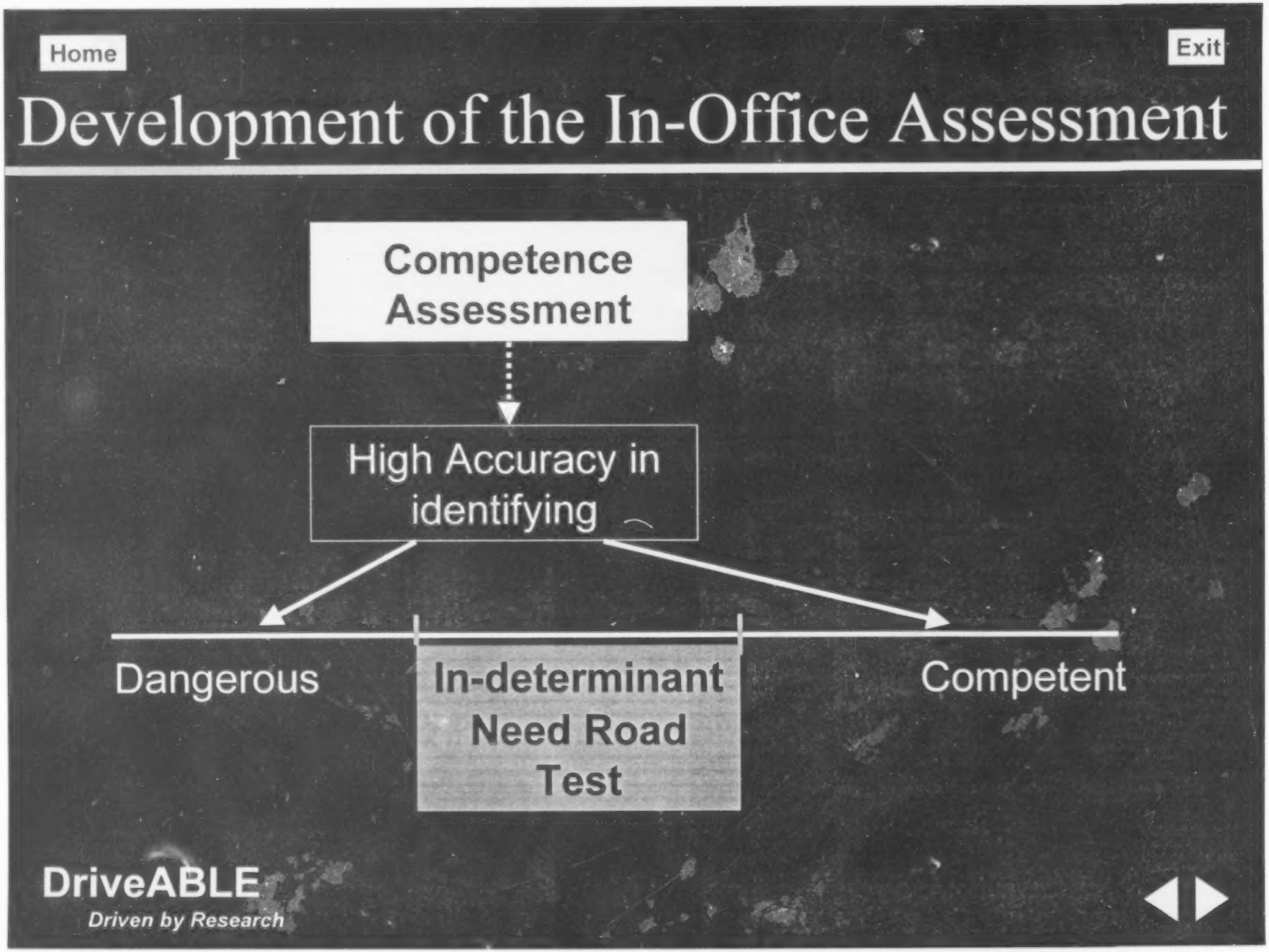
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Development of the In-Office Assessment
Competence Assessment
High Accuracy in identifying
Dangerous
In-determinant Need Road Test
Competent
DriveABLE
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The DriveABLE Assessment

On-Road Assessment

Dual-brake for safety

Only competence errors recorded

Competent drivers protected

Proven effective road course

Standardization

Validated equally fair for urban and rural drivers.

Continued Quality Assurance

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Assessment Goal

Two reasons for assessment:

- Competence assessment for licensing decision
- Rehabilitation assessment for rehabilitation

Important to differentiate.

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Assessment Goal

Two reasons for assessment:

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- Rehabilitation assessment for rehabilitation

Important to differentiate.

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Why Have Standardization?

- Medical example:
- Think of the difficulties if there was not standardization in medical diagnosis.
  - If each professional:
    - used his/her own criteria based on their own reading of the literature…

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Why Standardization in Driving Eval?

Licensing Authority's Perspective:

Evidence for licensing decision should be the same for all drivers,

- regardless of where tested
- by whom.

Issue is fairness and consistency for all drivers.

How can license suspension be justified if the person would be able to retain driving privileges if he/she went to a different evaluator?

Assessment 'shopping' is not an attractive alternative.

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Standardization

What is it?

Equal outcome across clients, across evaluators, and across sites.

Diagnosis as an 'easy' example:

Can look for a standard set of symptoms

Can use the same 'tool' to detect symptoms

Can use the same criterion.

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Standardization

What is it?

Equal outcome across clients, across evaluators, and across sites.

Driving as a '**hard**' example:

Driving errors and other performance measures = Symptoms

Road course is the 'tool'

Pass/Fail is the 'diagnostic' criterion

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Standardization

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Standardization

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Road Course Difficulty

If course difficulty differs from site to site, can not justify the outcome for any driver.

Driver could have had a different outcome at a different site.

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The Elements of Standardization

- Training to a standard.

Quality Assurance to insure standard maintained.

Scoring (Performance measurements).

Road Course (What is used to elicit the performance).

Pass/Fail Criterion (Performance criterion).

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DriveABLE's Approach to RT Devel.

Step 1: Define attributes of a road course needed to reveal competence defining errors.

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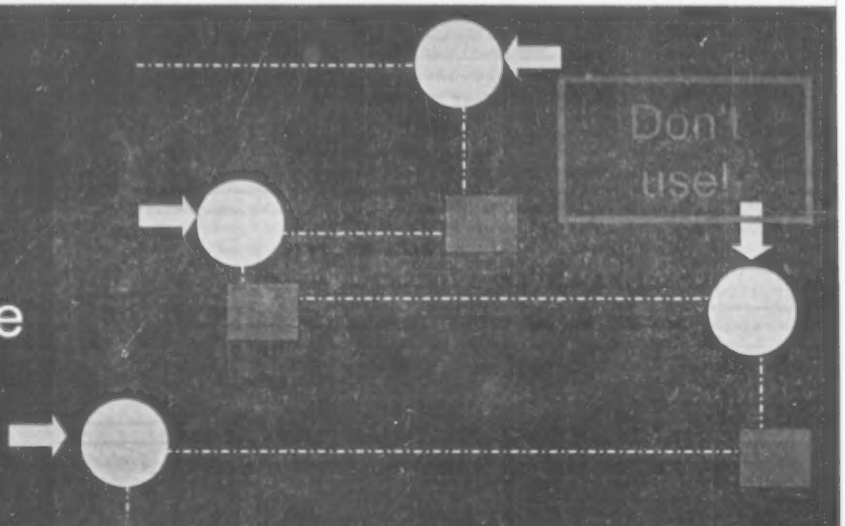
Defining an Effective Road Course

1. Plot out the road course.

2. Identify where the competence defining errors occurred.

3. Identify road and other conditions associated with these error locations.



Maneuver, etc.

Lanes
Speed
Controlled/Uncontrolled
Visual Conditions
etc.

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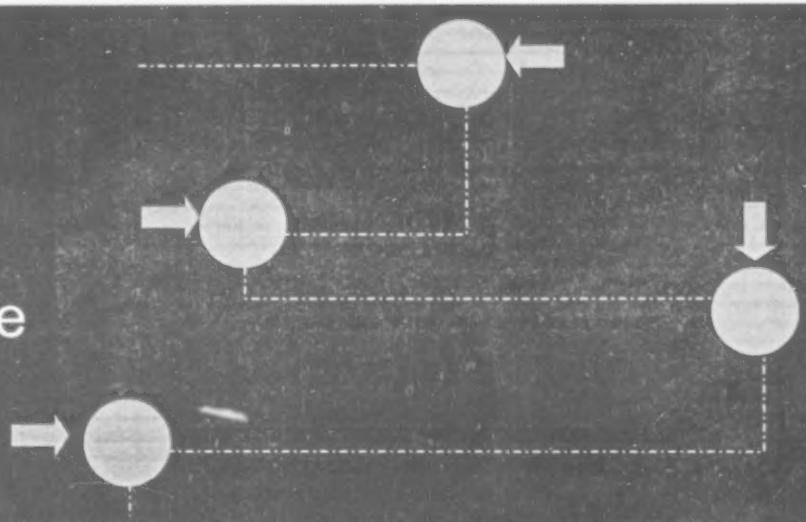
Defining an Effective Road Course



1. Plot out the road course.

2. Identify where the competence defining errors occurred.

3. Identify road and other conditions associated with these error locations.

4. Define attributes needed to effectively reveal the competence defining errors for medically impaired drivers.

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Defining an Effective Road Course

Step 2: Lay out a road course that includes the requisite maneuvers, road, and environmental conditions.

Progress simple to more complex for safety, try to match difficulty.

Road course may be 'effective', but it may be more or less difficult than others and, thus, not allow for equal outcome.

Standardization has not been accomplished.

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Defining an Effective Road Course

Step 3: Determine road course difficulty and accommodate difference from standard.

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Road Course Standardization

Almost without exception, the difficulty of any two road courses will differ in difficulty.

Questions:

How would you know?

What could be done to equate?

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The Standardization Process

To evaluate difficulty,

need an *external criterion* against which each road course can be evaluated.

Criterion requirements:

- Must have been shown to be related to driving
- Evaluate same drivers as take road test.
- Must be identical test for all drivers across all sites.

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DriveABLE's External Criterion

DriveABLE has an In-office Competence Assessment.

- Always the same at each site.
- External to the road test.
- Relationship between Competence Assessment and Road Test performance has been determined.

Initially, all clients complete both the In-Office Competence Assessment and Road Test .

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Measuring Road Course Difficulty

Given the performance on the Competence Assessment for a group of clients:

a) If the fail rate is too high, the RT is more difficult than the standard and the points needed to fail (driving errors plus severity) is adjusted upward to accommodate the higher difficulty.

b) If the fail rate is too low, the RT is less difficult than the standard and the fail criterion is adjusted to accommodate the lower difficulty (fewer driving error points required to fail).

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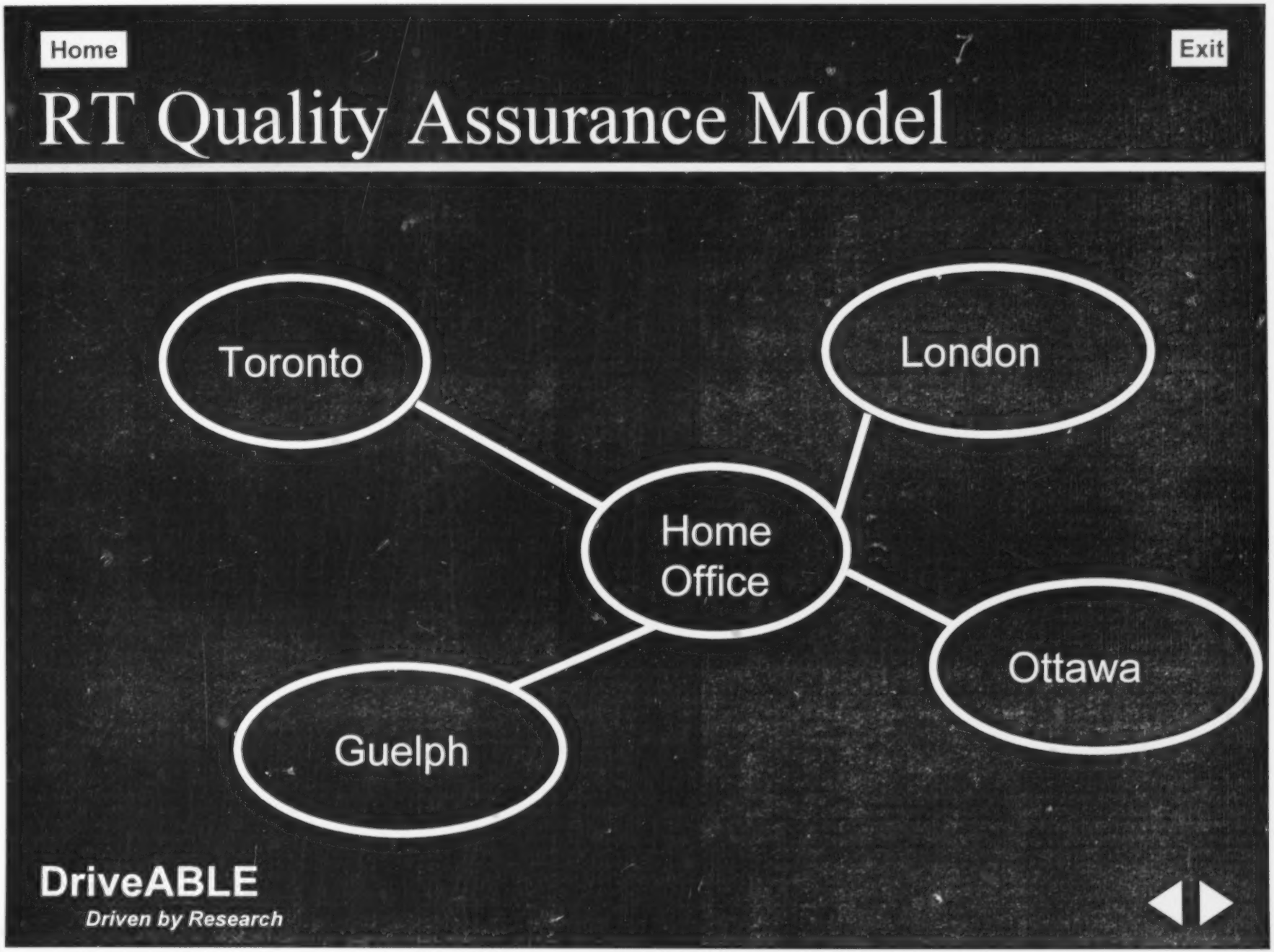
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RT Quality Assurance Model
Toronto
London
Home Office
Ottawa
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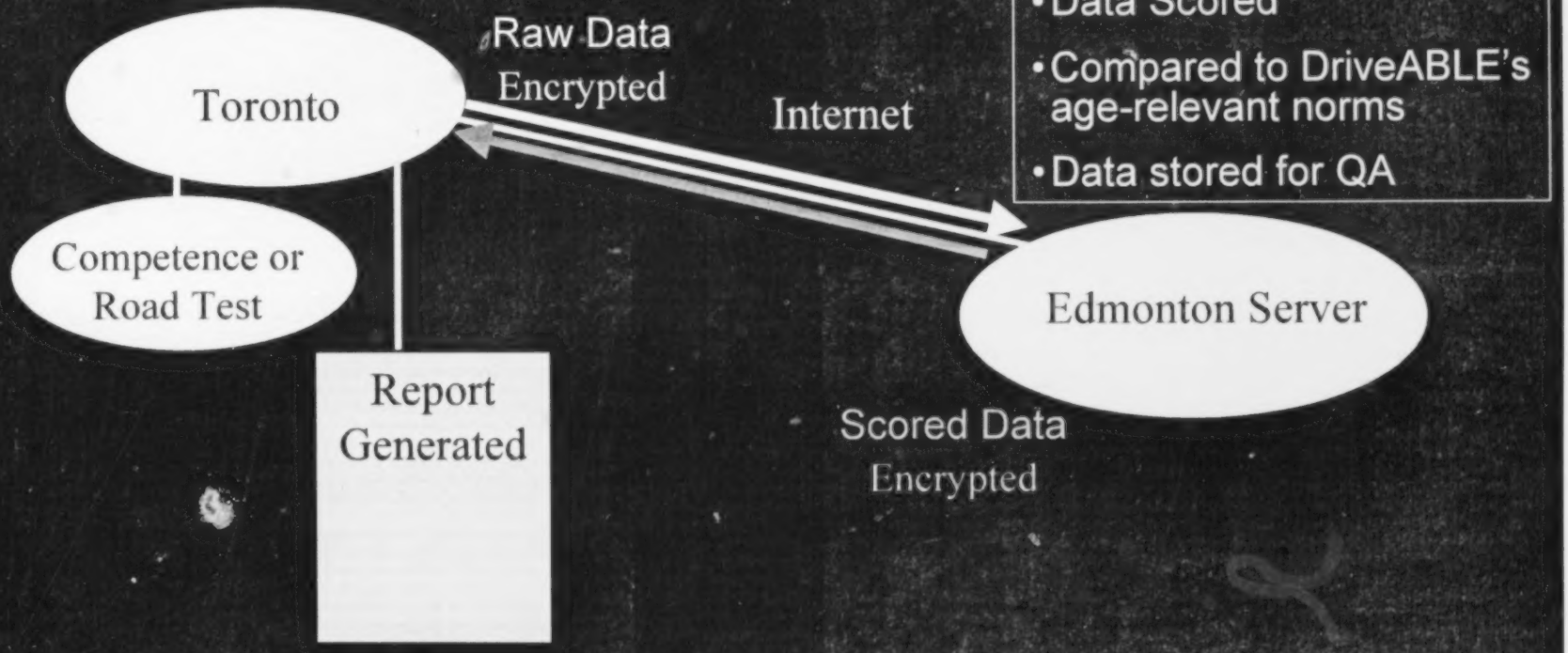
RT Quality Assurance Monitoring



The DriveABLE Model

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RT Quality Assurance Monitoring

1. Calibrated relationship between External Criterion and Road Test outcome must be maintained.

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RT Quality Assurance Monitoring

2. Driving Evaluator judgment standard.

After every drive, driving evaluator makes ratings.

Evaluators Ratings of Facets

- Left turning
- Right turning
- Defensive Driving
- Etc.

Evaluate Relationship

Evaluators Error Severity Ratings

- Turning errors
- Positioning errors
- Observation errors
- Etc.

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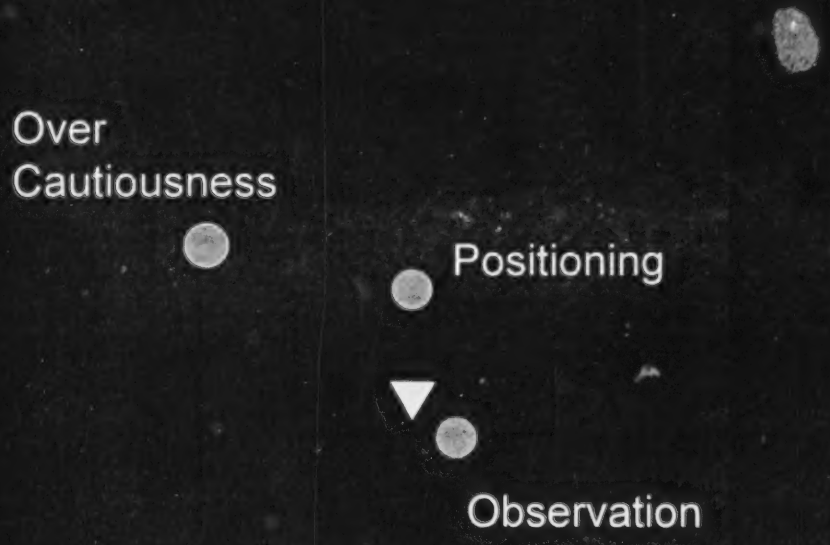
RT Quality Assurance Monitoring

4. Driving Evaluator Scoring of Error-types:



Edmonton Data Summary

Road Course Position	Error Types Pos.	Obs.	Caut.	etc
1				
2	X			
3				
4		X		
5				
6	X			
7		X		
8				
9			X	
Etc.				

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Urban and Rural Drivers

Are different RTs and standardization procedures needed for urban and rural drivers?

Important to determine the fairness of any assessment for both urban and rural drivers.

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Urban and Rural Driver Comparison

Matched 100 urban with 100 rural drivers on age, sex, diagnosis, level of cognitive impairment (MMSE).

Examined p/f rate of the urban and rural drivers.

Found performance of two groups not different (2% difference)

The assessment is equally fair for urban and rural drivers.

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7. Effective Reports

Reports to physician, licensing authority, and others must be accurate, clear, and easy to process.

Maximizing Safety

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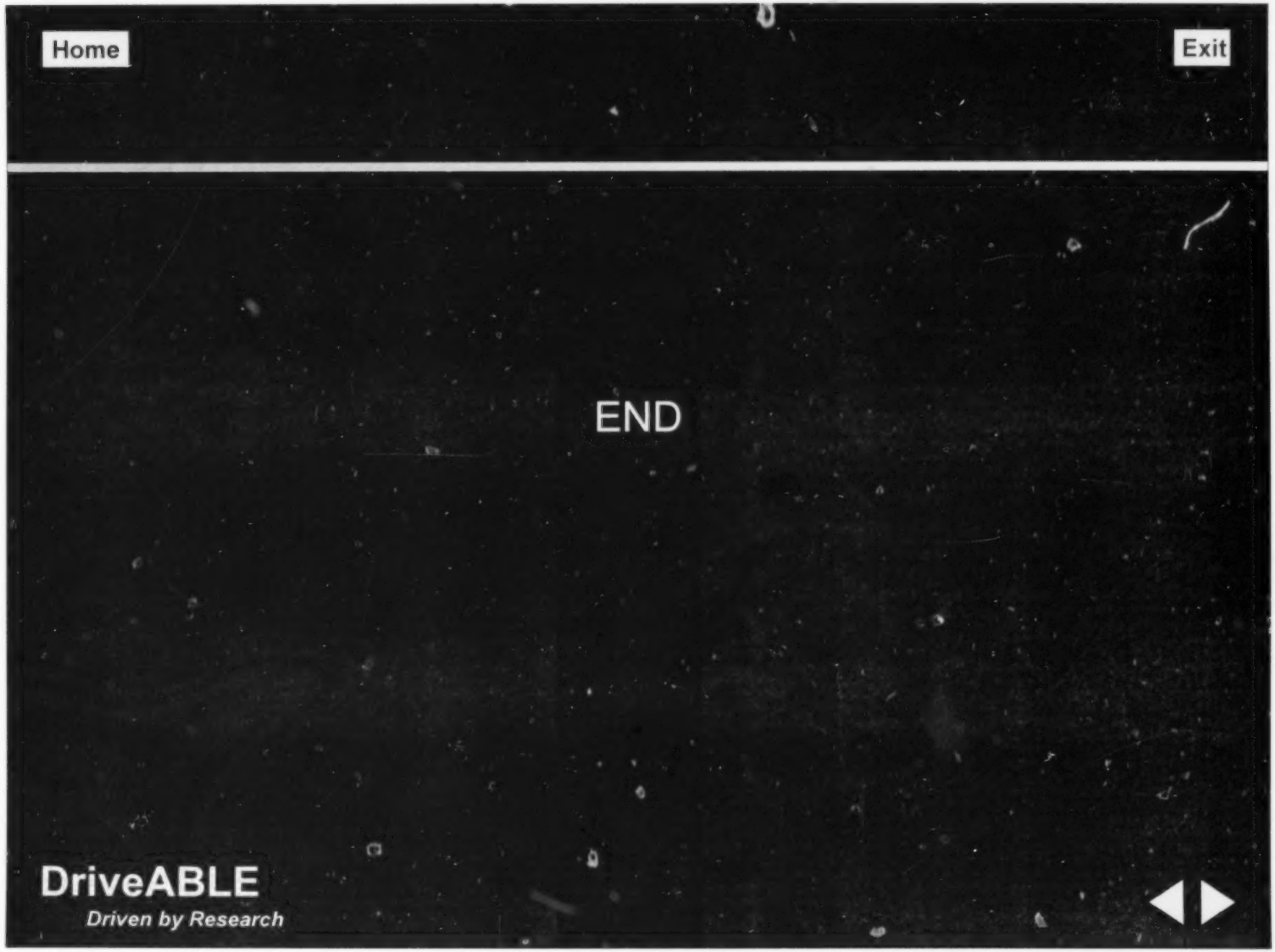
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END
DriveABLE
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Competence Assessment Fail

Exit

Reports (Client/Referral Information)

Assessment Date: June 30, 2004

Name: William Driver

Address: 1217 Water Drive
West Vancouver, BC
V7T 1B4

Phone: 555-2392

Referred by: N. Doctor, MD.

Phone: 555-2279 Fax: 555-6535

Assessment Language: English

Date of birth: June 22, 1927

Age: 77

Health Care #: 90XXXXXXX

Driver's License #: 76XXXX

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Home

Competence Assessment Fail

Exit

Report (Outcome Recommendation)

Driving Assessment Report

Recommendation:

Driving cessation is strongly recommended.

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Home

Competence Assessment Fail

Exit

Report (Outcome Summary)

In-Office Competence Assessment:

Mr. Driver was given sufficient individualized practice on each task to enable a valid assessment and appeared cooperative and effortful during testing.

Assessment Outcome Measures (Standard Scores)

Motor Speed and Control:	-1.6	below average for age
Span of Attentional Field:	-3.7	very poor for age
Spatial Judgment and Decision Making:	-1.2	below average for age
Speed of Attentional Shifting:	-2.5	very poor for age
Executive Function:	-2.2	very poor for age
Identification of Hazardous Driving Situations:	-4.6	extremely poor for age

Overall Performance:

Mr. Driver's overall performance was outside the range of normal healthy drivers defined through the research and commensurate with driving ability having declined to an unsafe level. Continued driving can place Mr. Driver's safety and the safety of others is at high risk. Driving cessation is strongly recommended.

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Competence Assessment Fail

Exit

Report (Outcome Summary)

On-Road Evaluation:

Mr. Driver was not given an on-road evaluation. The research showed that 9/10 individuals performing in this range on the In-Office Competence Assessment make significant and often dangerous driving errors. A test drive on public roadways would present an unnecessary risk to the driver and other road users.

DriveABLE

Driven by Research

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Road Test Fail

Exit

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Report (Outcome Recommendation)

Driving Assessment Report

Recommendation:

Driving cessation is strongly recommended.

DriveABLE

Driven by Research

Report (Outcome Summary)

On-Road Evaluation:

Mr. Driver appeared cooperative and effortful during testing. In the evaluation, simple, explicit directions for each driving maneuver are given. A dual-brake car is always used for safety reasons. The driving performance is compared against normal, healthy drivers who also drove a dual-brake car. Minor handling errors typical of drivers in an unfamiliar vehicle are not a part of the scoring. Only competence defining errors identified by the research are scored.

The weather and road conditions were good. Traffic was light to moderate.

Overall Performance:

The significant driving errors made by Mr. Burton are listed on the following page.

Mr. Driver's driving errors were outside the range of normal healthy drivers and beyond reasonable road safety as defined through the research. The driving errors were of the type and severity demonstrated by the research to be characteristic of medically impaired drivers and are commensurate with driving ability having declined to an unsafe level. Continued driving can place Mr. Driver's safety and the safety of others at high risk.

Driving cessation is strongly recommended.

The recommendation is based on criteria developed through the scientific comparison of medically impaired and normal, healthy drivers across a broad age range. Those criteria enable normal, healthy drivers of Mr. Driver's age to receive a passing score.

The DriveABLE Road Evaluation has been demonstrated through research to be equally sensitive and fair for both urban and rural drivers.

DriveABLE

Driven by Research

Home

Road Test Fail

Exit

Report (Outcome Summary)

During the DriveABLE Road Evaluation, Mr. Burton made the following significant driving errors. Only competence-defining driving errors defined by the research are listed.

[1] Turned from improper lane
[2] Turned into improper lane
[3] Dangerous left turn creating a hazardous situation; other road users affected
[4] Turned from improper lane creating hazardous situation; other road users affected
[5] Dangerously changed lanes without adequate observation
[6] Drove on wrong side of road for a significant distance; evaluator intervened
[7] Straddled lanes on curve or straight roadway

The evaluation was aborted as it was unsafe to continue.

DriveABLE
Driven by Research

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Maximizing Safety

Road testing all clients on public roadways can place other road users in danger.

Some medically impaired drivers are very dangerous.

Need a way to identify at least the most dangerous drivers without a road test.

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Driven by Research

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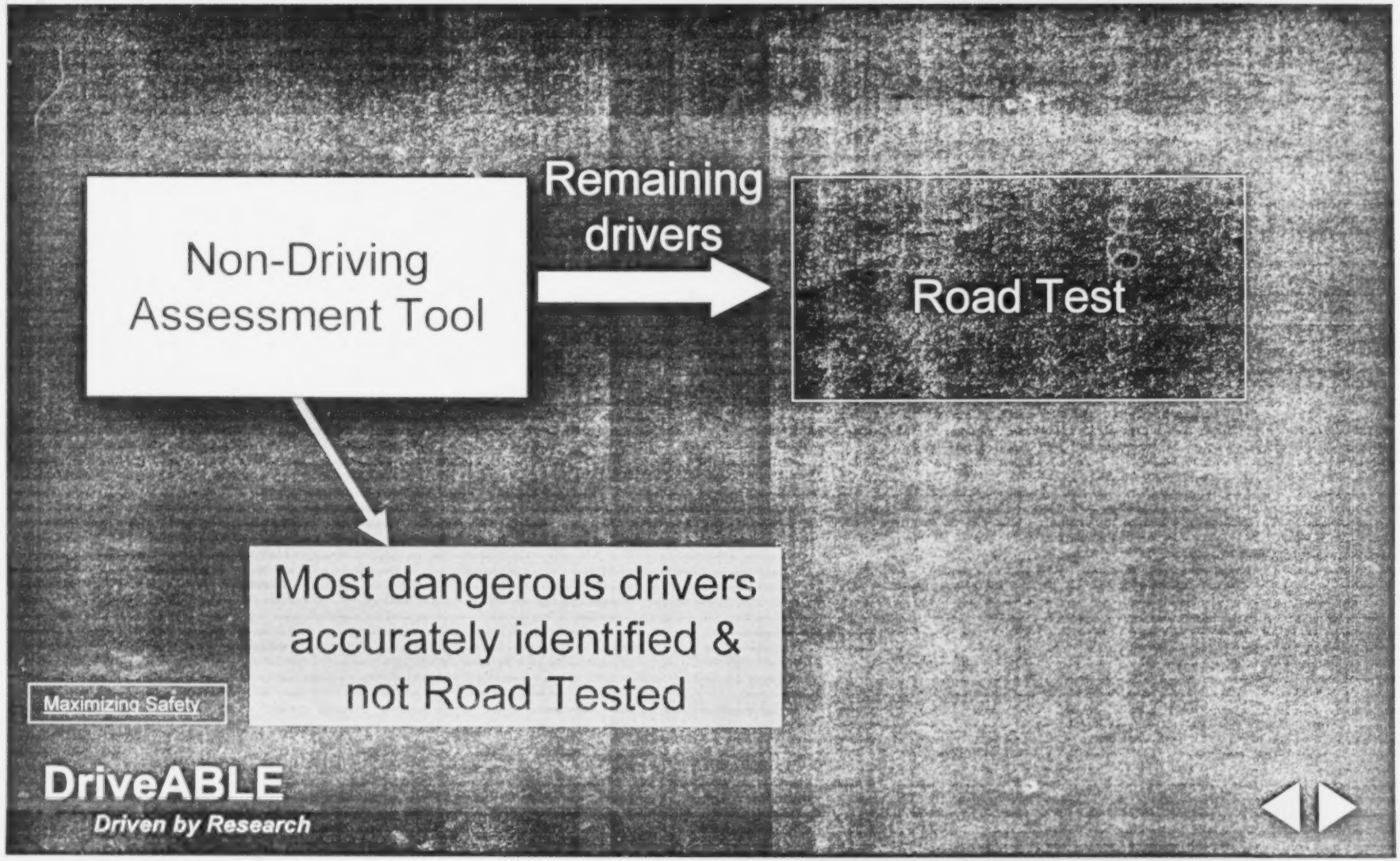
Safety concerns need to be Accommodated



Maximizing Safety

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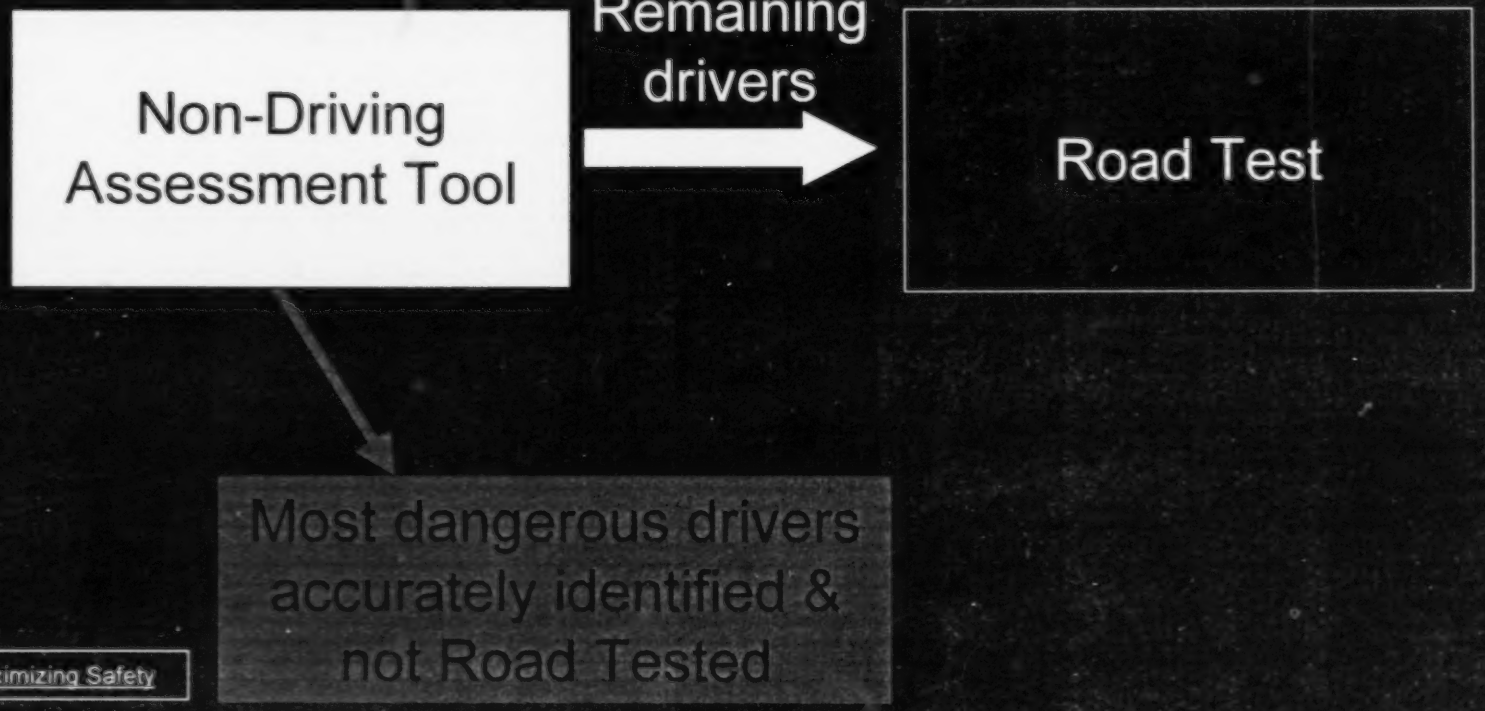
Safety concerns need to be Accommodated



Maximizing Safety

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Traditional Approach

Task analysis to 'identify' domains (usually by rational or consensus judgment).

Identifying a test to represent each domain.

Form an assessment battery from those tests.

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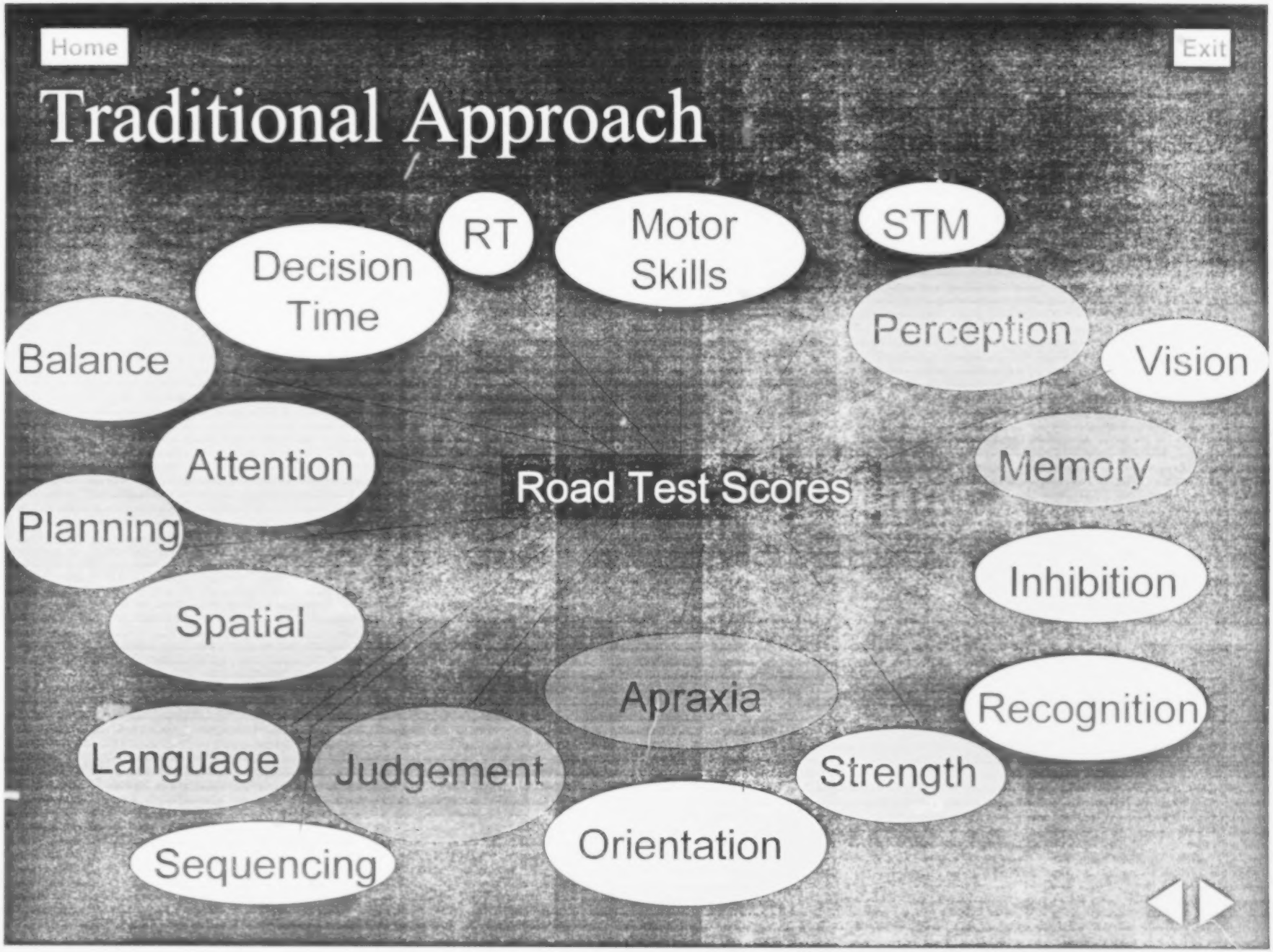
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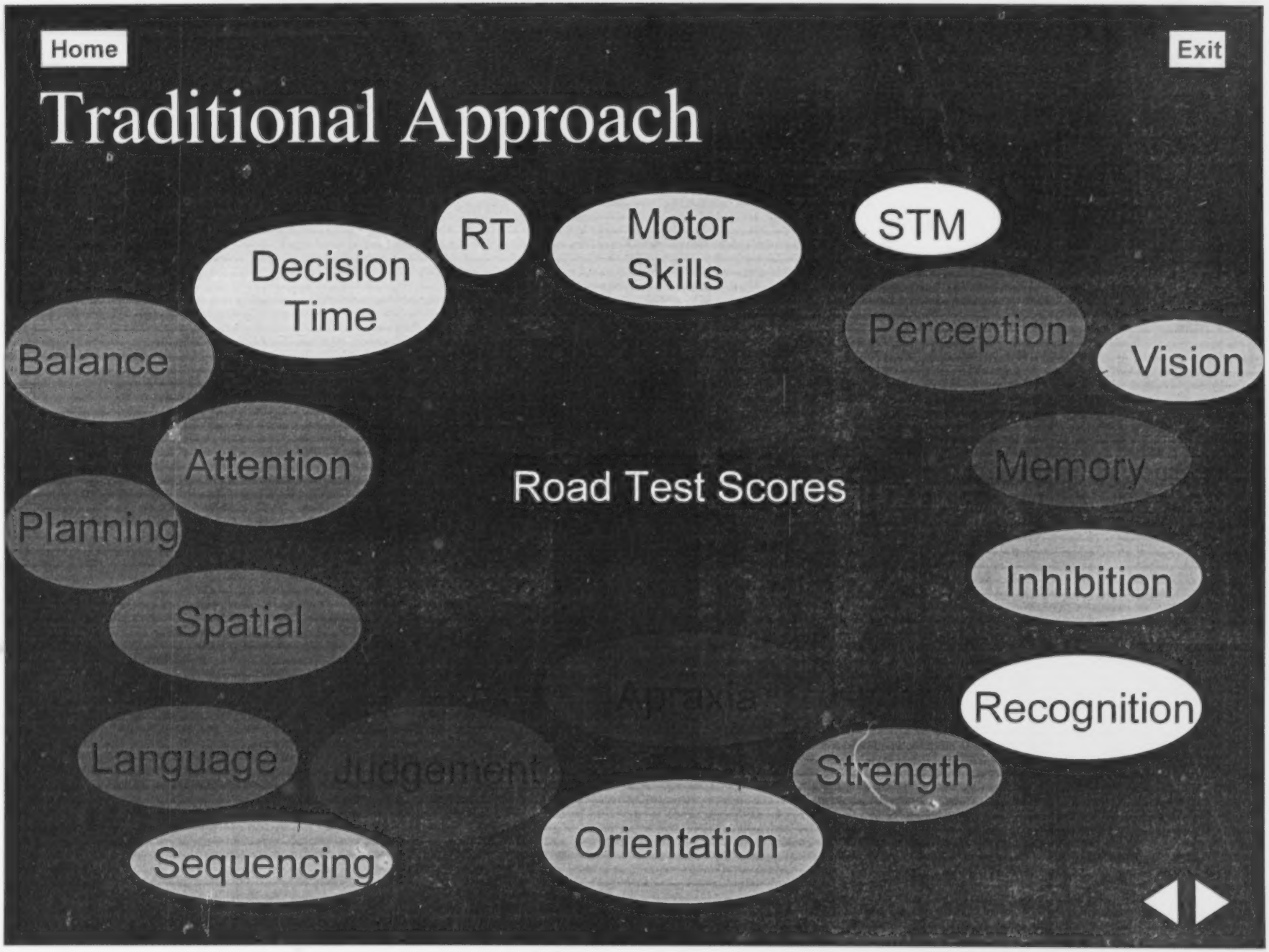
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Selecting Tests, Traditional Approach

Select tests to represent domains

Domain A

Domain B

Domain C

Domain D

Domain E

Domain F

Domain G

Best predictor from domain

Best Predictor from domain

Battery

Test A

Test B

Will not maximize the predictability of battery.

Approach does not indicate the predictability of the BATTERY

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Exit

Traditional Approach

Driving requires concurrent use of different abilities from different domains and shifting among abilities from different domains.

Traditional approach misses this essential component.

Home

Exit

New Approach

Goal is to predict driving performance.

- Complex tasks are used to test many abilities at once
  - Shortens testing time
  - Enables testing of abilities, and concurrent use of abilities, and ability to shift

Tasks are easy to do, norms are for persons of the client's own age.

DriveABLE

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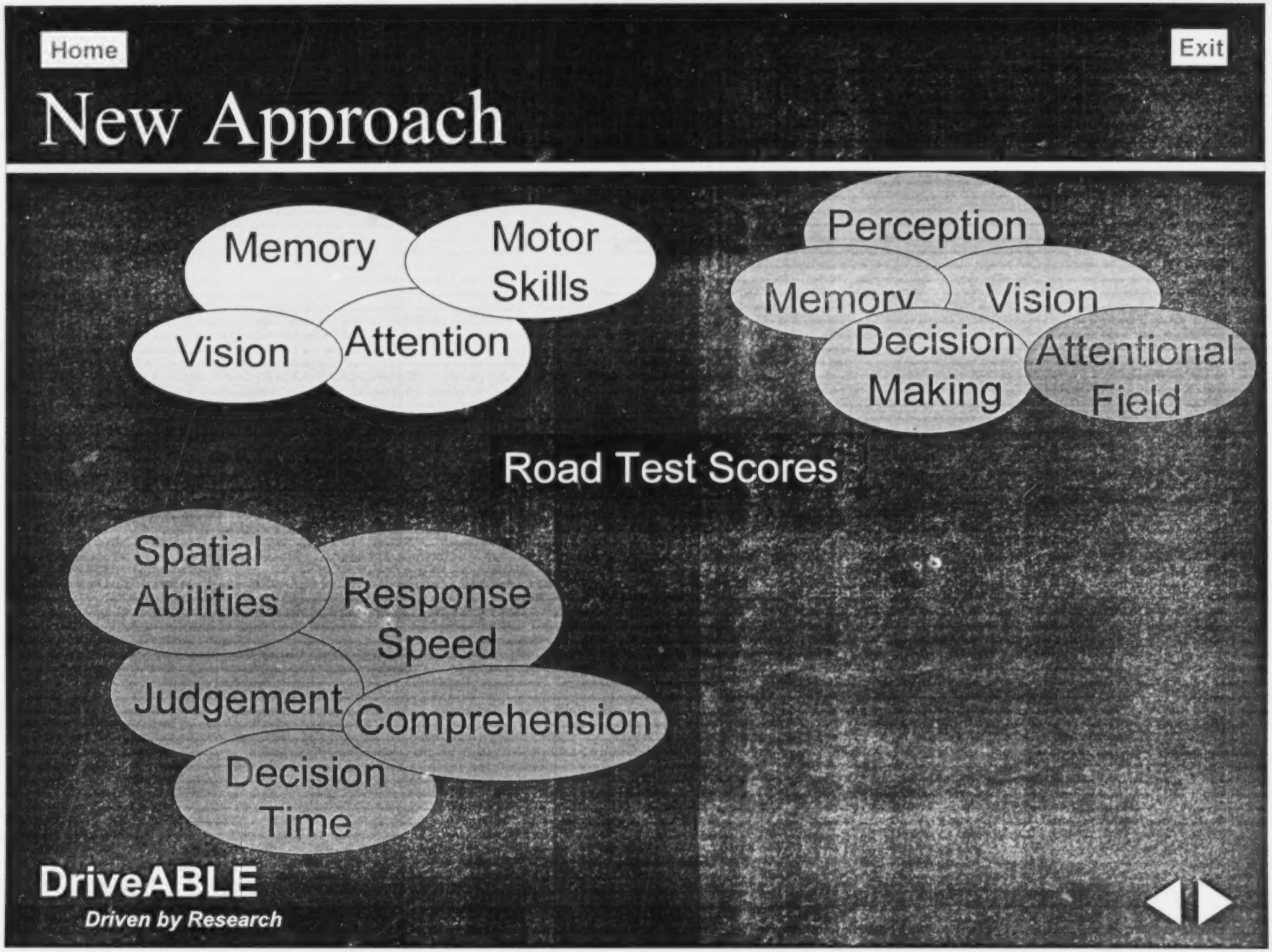
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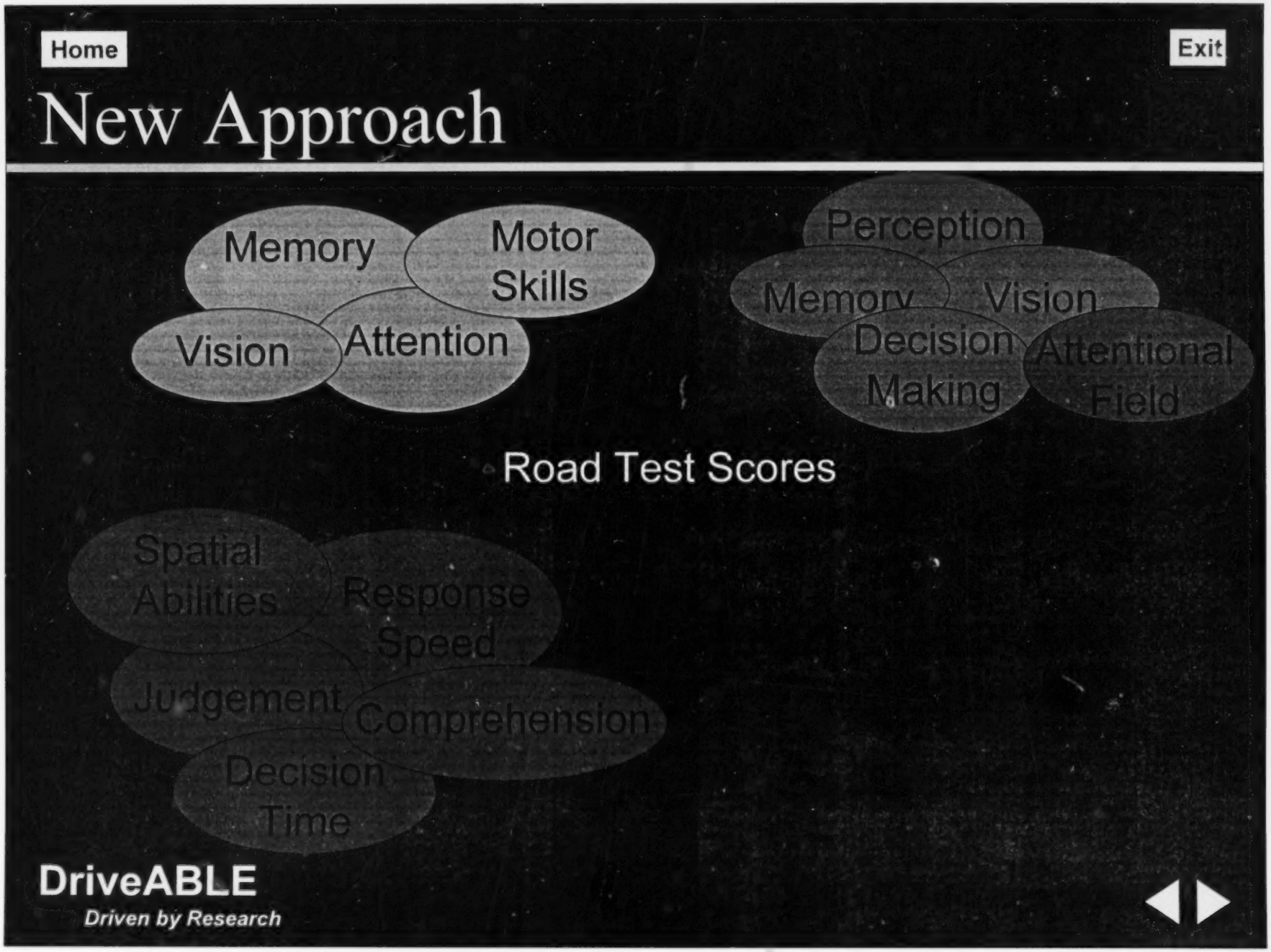
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Response Speed
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Comprehension
Decision Time
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Selecting Tests, Max. Predictability

Select tests to maximize predictive validity of the Battery.

Test A

Test B

Test C

Test D

Test E

Test F

Test G

Best Predictor

Adds Most to Prediction

Battery

Test C

Test E

Still important to validate predictability of newly formed battery on new sample

DriveABLE

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Exit

Maximizing Safety

Testing needs to be done in a dual-brake car.

Because:

Testing is done on public roadways.

Driver and driving evaluator safety are at risk.

Completely justifiable when compared against a control group also tested in a different vehicle.

DriveABLE

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Exit

Validated in New Study

- Competence defining driving errors
- Road Course Design
- Performance Criterion
- Predictive power of Competence Assessment (95% accuracy)

- Now evaluating other impairments
- Rating individual drives

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Exit

Real Drivers, Real Driving Errors

Video clips taken from research phase.

All drivers currently licensed, all currently driving.

Sent for a driving assessment by physicians.

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Exit

Patient with Cerebral Vascular Disease

Left-turn requested

Evaluator takes control to avoid driving onto sidewalk

Home

Exit

Patient having Cerebral Vascular Disease

Left-turn requested

Driver makes U-turn

Home

Exit

Patient with probable Alzheimer's Disease

Lane change needed for upcoming right-turn

Evaluator takes control to avoid crash

Home

Exit

Patient having Ischemic Vascular Disease

Left-turn requested

Wrong-way on the freeway, evaluator takes control

Home

Exit

Patient having probable Alzheimer's Disease

Fails to observe pedestrian, evaluator takes control to avoid hitting pedestrian

Home

Exit

Patient having Probable Alzheimer's Disease

Drifts left out of lane, hits median

Home

Exit

Same AD patient

Drifts left, evaluator takes control to avoid crash

Home

Exit

Same AD patient

Drifts left, evaluator takes control to avoid crash

Home

Exit

Patient with Congestive Heart Failure

Left-turn requested

Unsafe turn is executed

Home

Exit

The Road Test: Defining the Essentials

1. Scoring System (What driving errors matter?)
2. Road Course (Revealing the competence problems)
3. Performance Criterion (Defining unsafe to drive)
4. Standardization (Outcome comparability across assessment sites)
5. Quality Assurance (Maintaining the quality standard)
6. Urban and Rural Drivers (Fairness/Adequacy for both)
7. Effective Reports (Meaningful, clear, and useful)
8. Maximize Safety (For client, public, and evaluator)

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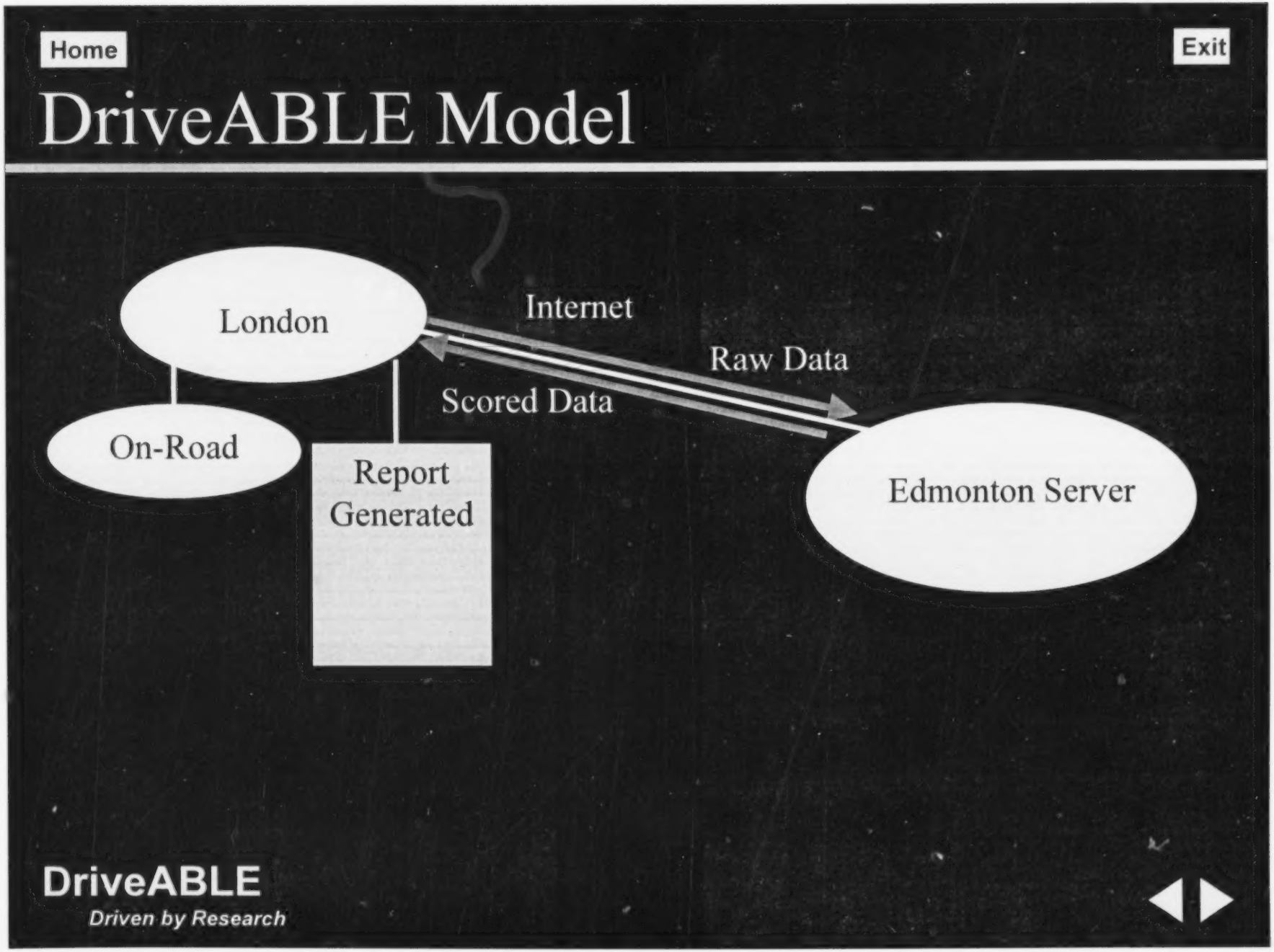
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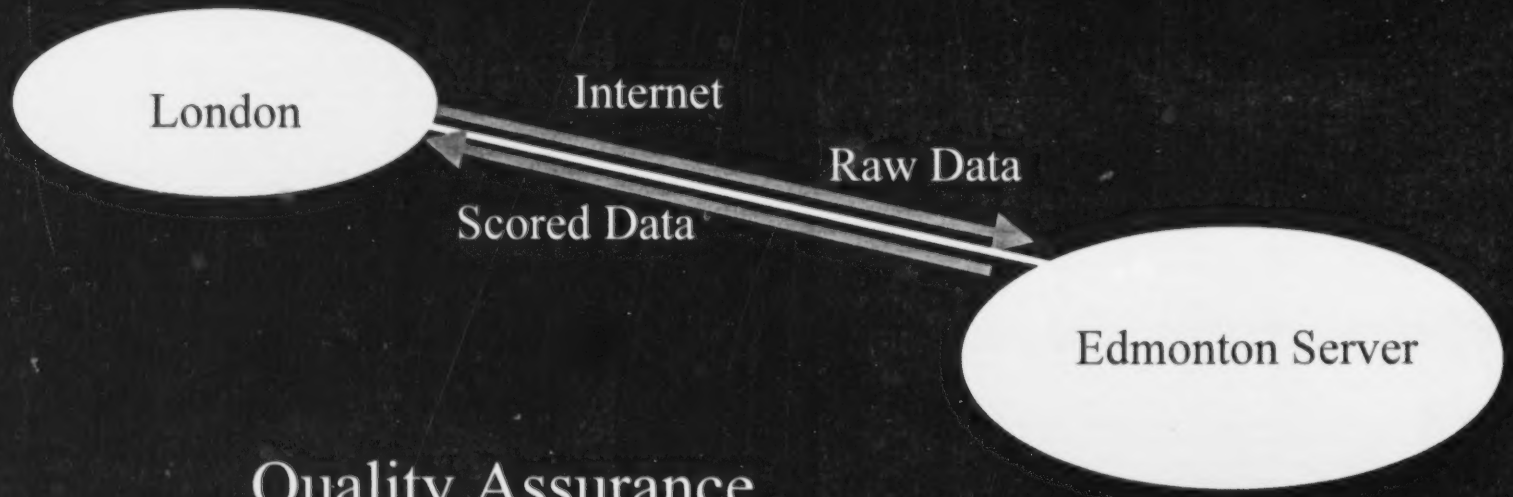
DriveABLE Model



Quality Assurance

DriveABLE

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Original Study Findings

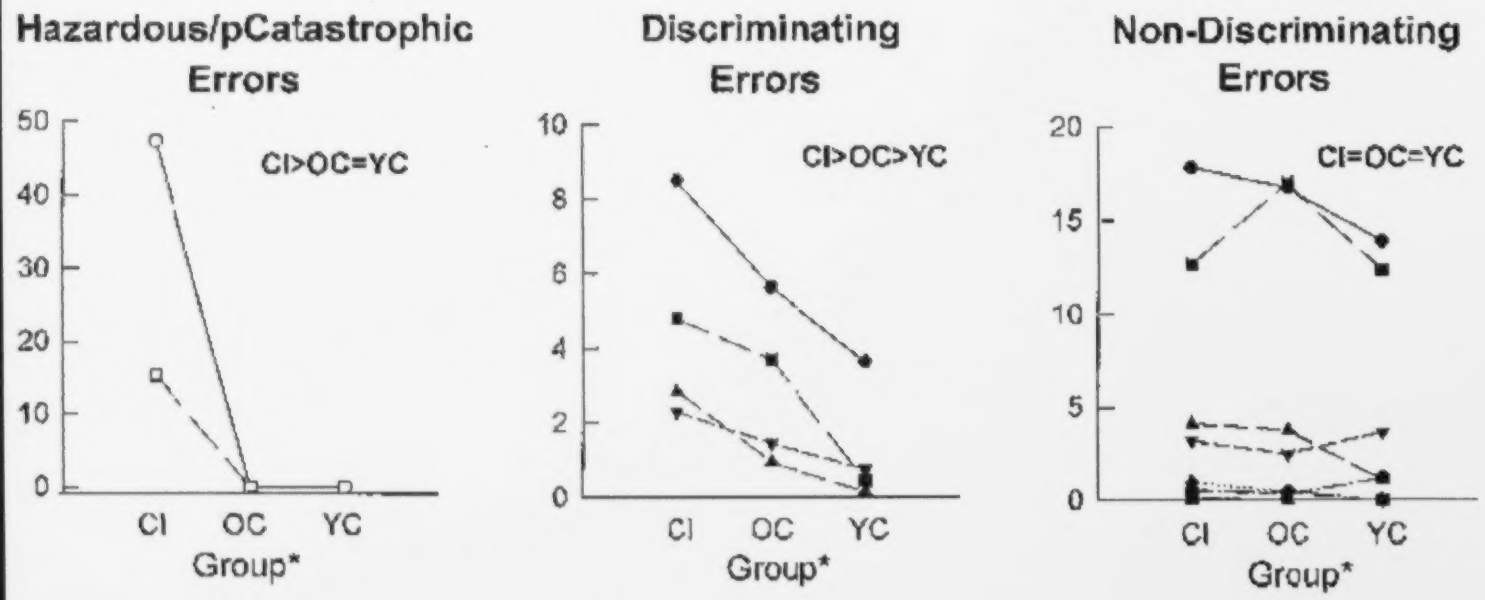

Fig. 1. Three groupings of error categories isolated by ANOVA.

*CI = Cognitively Impaired, OC = Old Controls, YC = Young Controls

DriveABLE

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Testing the road-course rules

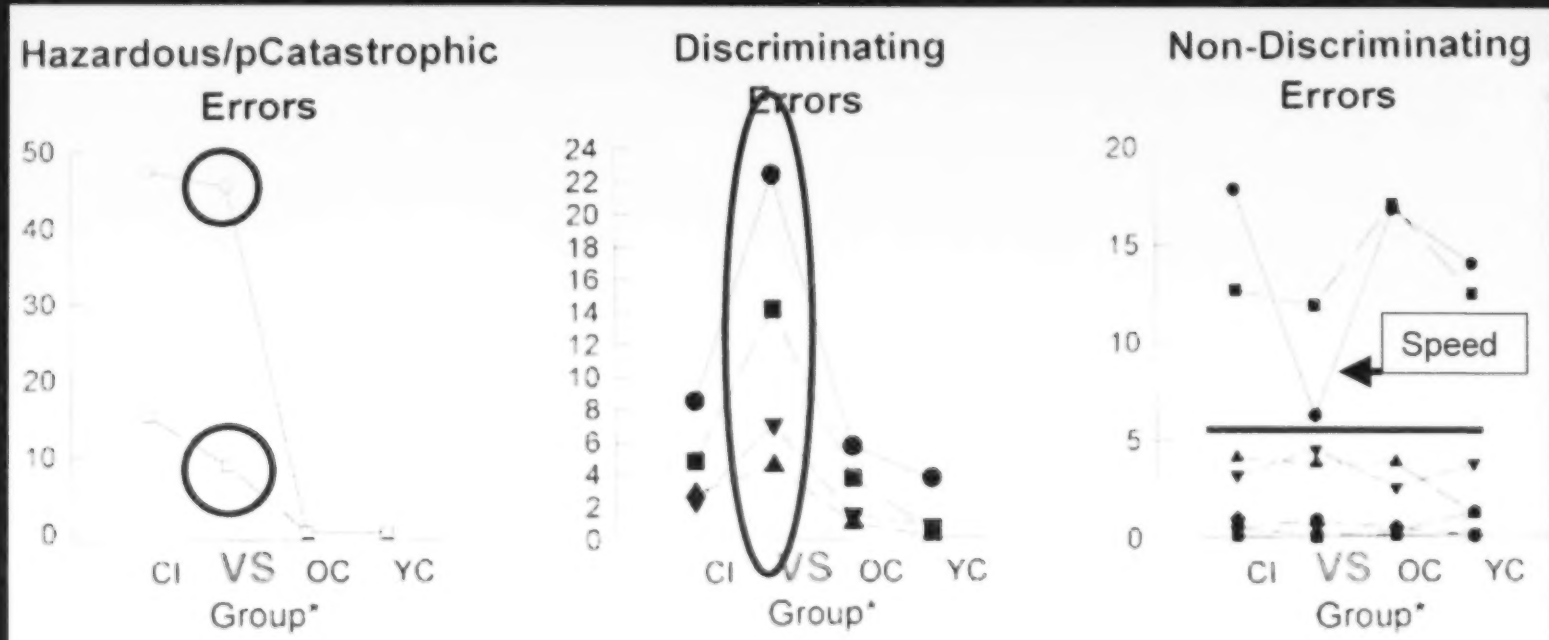

Fig. 2. Three groupings of error categories isolated by ANOVA.

*CI = Cognitively Impaired, OC = Old Controls, YC = Young Controls, all from the original study

VS identifies the group from the Validation Study.

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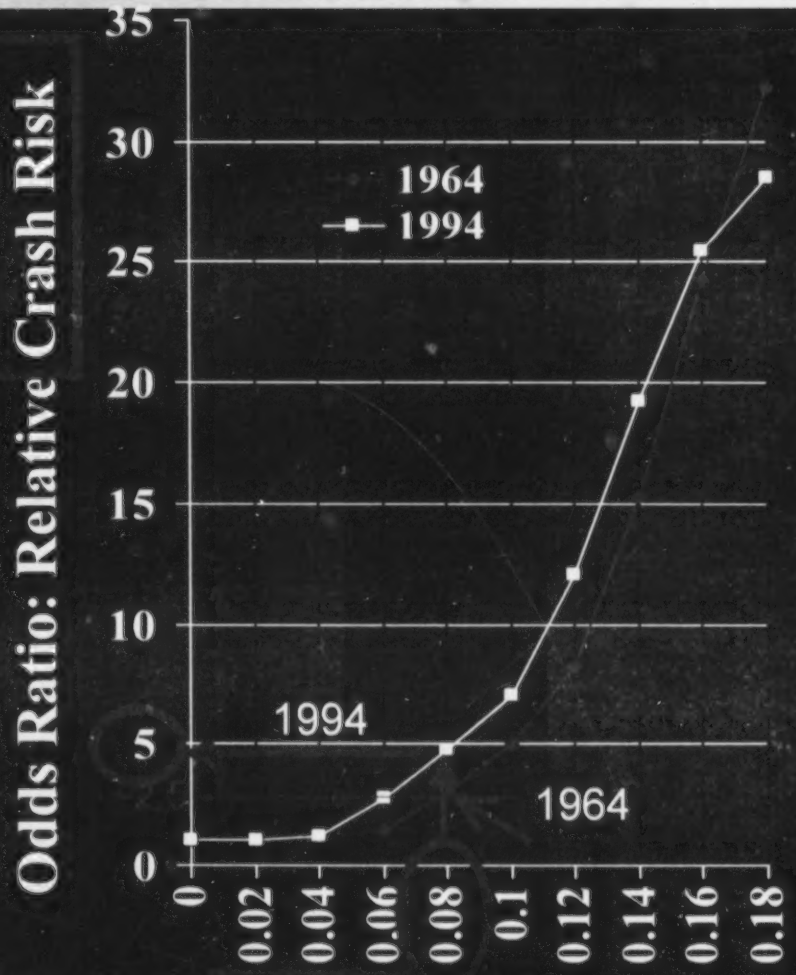
Accident risk as function of Blood Alcohol Content



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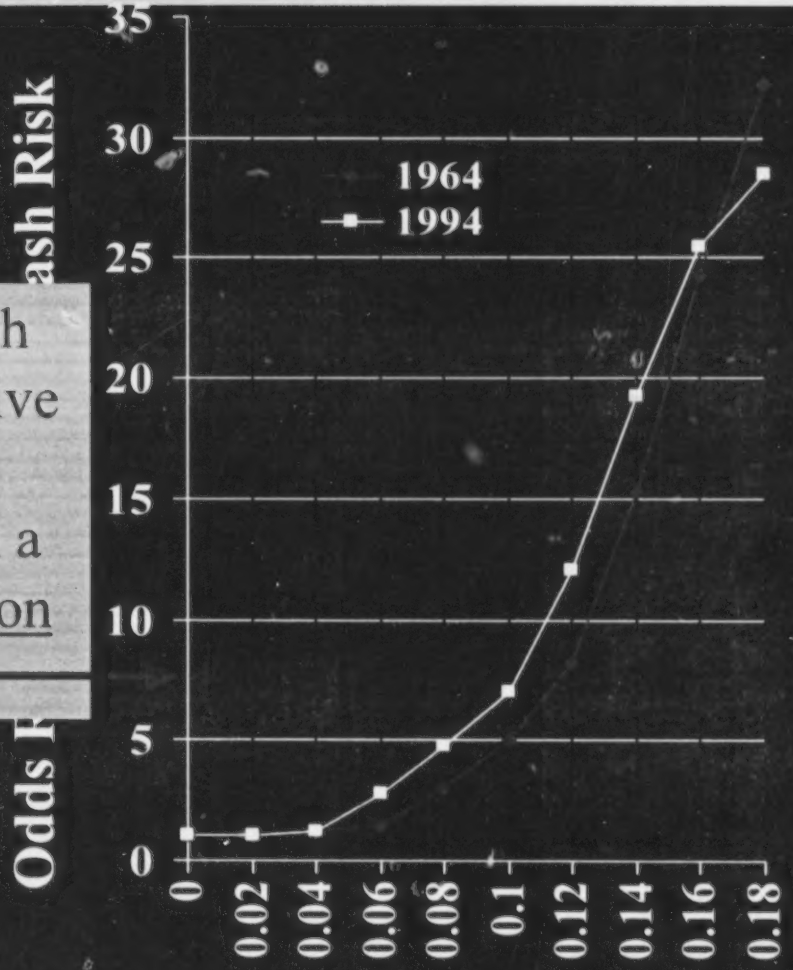
Accident risk as function of Blood Alcohol Content



Increased Crash Risk for Cognitive Impairment associated with a medical condition is 7.6

First Slide

Restricted Licensing

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Competence Assessment Pass

Exit

Reports (Client/Referral Information)

Assessment Date: June 30, 2004

Name: William Driver

Address: 1217 Water Drive
West Vancouver, BC
V7T 1B4

Phone: 555-2392

Referred by: N. Doctor, MD.

Phone: 555-2279 Fax: 555-6535

Assessment Language: English

Date of birth: June 22, 1927

Age: 77

Health Care #: 90XXXXXXX

Driver's License #: 76XXXX

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Competence Assessment Pass

Exit

Report (Outcome Recommendation)

Driving Assessment Report

Recommendation:

Driving cessation is NOT indicated by the In-Office Competence Assessment.

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Home

Competence Assessment Pass

Exit

Report (Outcome Summary)

SUMMARY OF FINDINGS

Mr. Driver was given sufficient individualized practice on each task to enable a valid assessment and appeared cooperative and effortful during testing.

Assessment Outcome Measures (Standard Scores)

Motor Speed and Control:	-1.6	below average for age
Span of Attentional Field:	-0.7	average for age
Spatial Judgment and Decision Making:	+1.2	above average for age
Speed of Attentional Shifting:	-0.5	average for age
Executive Function:	0.0	average for age
Identification of Hazardous Driving Situations:	-0.6	average for age

Overall Performance:

Mr. Driver's overall performance on the In-Office Competence Assessment reveals no evidence that competence is outside the range of healthy, normal drivers.

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Home

Road Test Pass

Exit

Reports (Client/Referral Information)

Assessment Date: June 30, 2004

Assessment Language: English

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DriveABLE
Driven by Research

Home

Road Test Pass

Exit

Report (Outcome Recommendation)

Driving Assessment Report

Recommendation:

Driving cessation is NOT indicated by the On-Road Evaluation.

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Home

Road Test Pass

Exit

Report (Outcome Summary)

On-Road Evaluation:

Mr. Driver appeared cooperative and effortful during testing. In the evaluation, simple, explicit directions for each driving maneuver are given. A dual-brake car is always used for safety reasons. The driving performance is compared against normal, healthy drivers who also drove a dual-brake car. Minor handling errors typical of drivers in an unfamiliar vehicle are not a part of the scoring. Only competence defining errors identified by the research are scored.

The weather and road conditions were good. Traffic was light to moderate.

Overall Performance:

The significant driving errors made by Mr. Driver are listed on the following page.

Mr. Driver's driving performance revealed no evidence that driving competence is outside the range of healthy, normal drivers.

Driving cessation is NOT indicated. Reassessment is recommended if there are significant changes in medical status or function.

The recommendation is based on criteria developed through the scientific comparison of medically impaired and normal, healthy drivers across a broad age range. Those criteria enable normal, healthy drivers of Mr. Driver's age to receive a passing score.

The DriveABLE Road Evaluation has been demonstrated through research to be equally sensitive and fair for both urban and rural drivers.

DriveABLE

Driven by Research

Canadian Consensus Meeting on Driving Evaluation in Older Drivers

Nicol Korner-Bitensky
McGill University (Montreal, Quebec)

Abstract

This talk highlights the recommendations made by participants of the Canadian Driving Consensus Meeting, a cross-Canada representation of more than 20 researchers, clinicians, and policy planners involved in driving. The Meeting is scheduled to take place in Edmonton on May 26, 2004.

The primary goal of the Consensus Meeting is to achieve consensus on:

1. indicators of the need for referral to a driving evaluator (especially in conditions such as stroke and dementia that are known to affect driving safety);
2. the necessary training, qualifications and specialized knowledge that a driving evaluator should have;

3. the key components to be tested during the pre-road evaluation (paper-based and computerized testing) that should be part of a standard assessment;
4. indicators that a client is not yet ready to be assessed in an on-road testing situation;
5. the components of the on-road assessment that should be included in a standard assessment (in traffic, on highway, in residential area, length of assessment, etc.);
6. driving behaviours that should result in a fail.

Preliminary recommendations are presented and a lively discussion with the audience initiated on those areas where further consultation and deliberation are judged necessary.

Home

Exit

Canadian Consensus Meeting on Driving Evaluation in Older Drivers

A Summary of the Working Group Recommendations

May 27th, 2004

Edmonton, Alberta

A CIHR funded Workshop/ CanDRIVE initiative

Home

Exit

Who participated?

- occupational therapists with a specific interest in driving
- CAOT representative
- physicians with an interest in driving in the elderly
- OEQ representative

Home

Exit

Participants

Susan Sofer
Louise Bouillon
Malcolm Hing
Shawn Marshall
Nicol Korner-Bitensky
Dana Benoit
Gaetan Fillion
Isabelle Gelinas
Sue Reil
Linda Hirsekorn
Linda Johnson
Shirley Rolin
Remo Minichiello
Sylvie Robitaille
Michelle Porter
Jan Miller-Polgar
Kathy Van Benthem
Louise Tremblay
Lynn Hunt
Margaret Young
Angela Kennedy
Grace Galezowski
Ingrid Menard
Dennis McCarthy

No participant declared a conflict of interest

Home

Exit

Objectives of the Meeting

- To come to consensus on:

1. Appropriate clientele for referral for assessment
2. Components of the pre-road assessment
3. Components of the on-road assessment
4. Critical behaviors to be assessed on the pre-road and on-road assessment

…using our clinical knowledge combined with the best evidence available

Home Exit

Purpose of a Consensus Group

- Is not to create or encourage consensus
- Rather, it is to assess it

Preliminary Phase: All participants completed a series of readings on the psychometric properties of various measures and completed a questionnaire

Home Exit

Clarifying the concepts of Screening and Assessment

In health care screening usually is:

- relatively quick
- relatively inexpensive
- a process that can be made widely available

Focus of the Consensus Group was assessment

Home

Exit

Clientele Focus

- Individuals >65 referred for a driving assessment

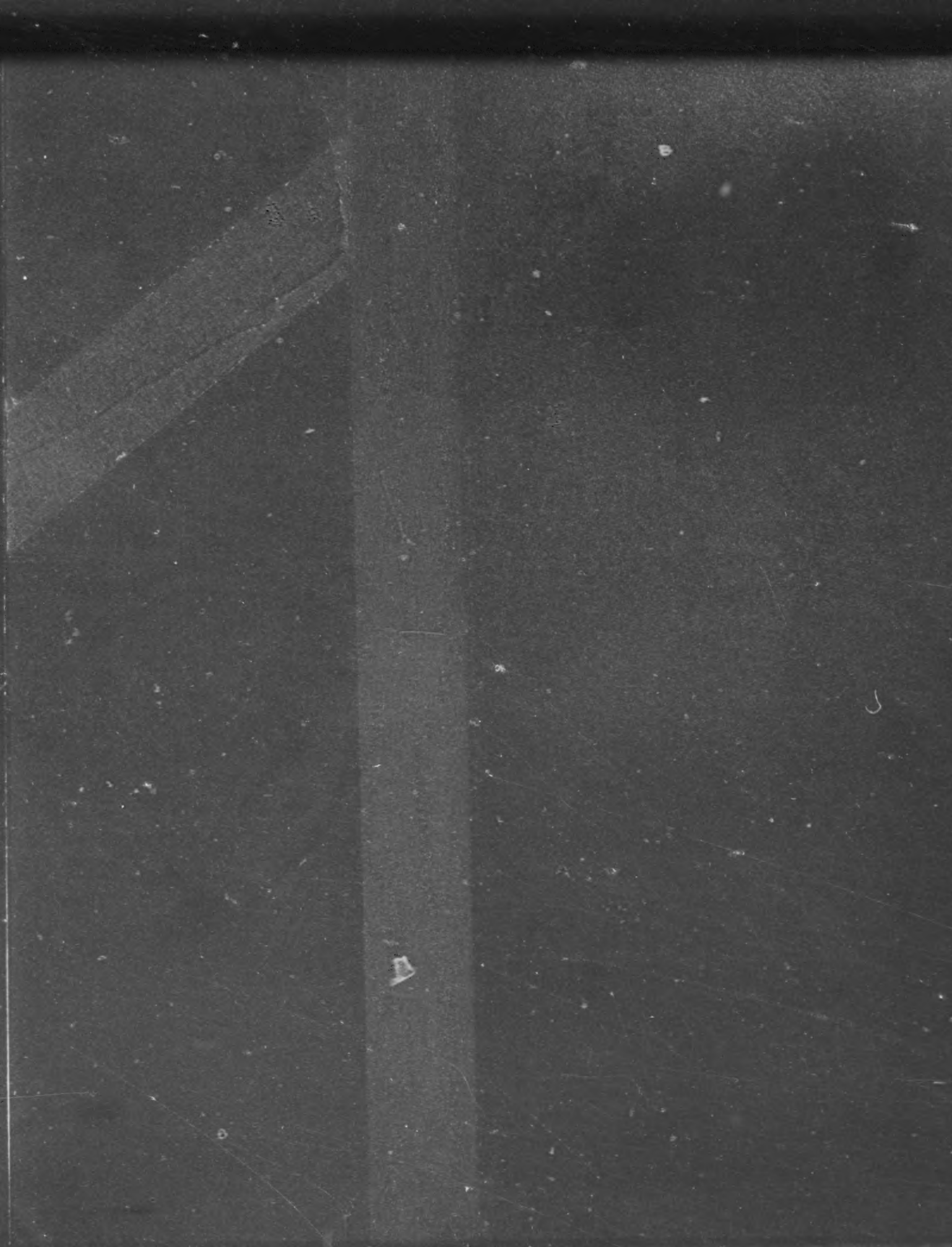
Excluded: those who had experienced a stroke

Home

Exit

The hierarchical Model of Task Performance in Driving

(Michon, 1979)



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Exit

The hierarchical Model of Task Performance in Driving

(Michon, 1979)

Home Exit

Pre-road Assessment

The Consensus was that:

- the comprehensive driving assessment should include a pre-road component
- ideally the pre-road assessment be done by the on-road evaluator

NOTE: where a standardized pre-road measure has been completed by another health professional the results may be used, based on the discretion of the on-road evaluator

Pre-road Assessment – Preliminary components

- Cognition
- Vision
- Reaction time
- Visual-perception
- Behavior (may not be done in a formal manner)
- Physical and motor

Note: Sensory was not recommended for formal assessment

Home

Exit

Pre-road Assessment – Preliminary components

- Driving history – including exposure, accidents, restrictions, self perception of driving performance
- Medical history – pertinent medications, conditions
- Vision (specifically meeting the visual requirements)
- Driving knowledge
  - (Recommendation for the use of a symbol recognition test which is known to be associated with driving performance)

Note: the Group also raised the point that while none knew of a standardized driving knowledge measure this would be a valuable component that some had created “in-house”

Home

Exit

Pre-road Assessment- Vision

The Consensus was that :

- visual screening (not testing) should be performed by the driving evaluator including acuity, contrast sensitivity and visual fields if the information is not available from an eye specialist.

- evaluation of glare recovery and depth perception were considered optional. Evaluation of diplopia was considered unnecessary unless there is a specific concern based on the medical condition of client.

- visual difficulties noted in the evaluation process be addressed with a referral to an eye specialist

Home

Exit

Pre-road Assessment – visual-perception

- Visual scanning – while no one tool was recommended the need to evaluate scanning of the far extra-personal space was noted
- Visual-perception – the Motor Free Visual Perception Test (MVPT) was suggested as an optional tool. NOTE: Group suggested that further testing of its predictive value in an elderly (non-stroke) would be valuable.

Home

Exit

Pre-road Assessment – Cognition

Domains recommended to be assessed:

- scanning
- executive functions
- organization
- planning
- insight
- judgment
- decision making
- multi-tasking
- attentional abilities
- self- perception / awareness
- impulsivity

Pre-road Assessment- Cognition

- Assessments:
  - Cognition (Trails A and B) was recommended based on its predictive value in identifying crashes and its ease of use
  - An alternative Trails was presented as a possibility for future use by OTs – currently no psychometrics are available in relation to driving

Home

Exit

Pre-road Assessment - Cognition

- Clock Drawing was considered optional. The Group noted that there is a scoring from the AMA that would be valuable for use.
- Mini-Mental State Exam (MMSE)– it has fair to good correlation with crashes. It is well understood by other health professionals and this was considered a plus. Recommendation: use but no decisions should be made based on specific cut-off scores. 3MS was also reviewed –not enough information was available to make a final recommendation.

Home Exit

Comprehensive Batteries

- DriveABLE Screen - The Group was unable to make a recommendation regarding the use of this tool based on a number of factors:
  - The lack of familiarity of many of the participants with the tool and its administration
  - The need for studies examining test-retest reliability

Home

Exit

Comprehensive Batteries

- Useful Field of View (UFOV) - The Group recommended the use of this tool based on a number of factors:
  - The strong psychometric properties
  - The strong correlation with crashes in the elderly

NOTE: the Committee acknowledged the cost associated with purchase of the UFOV equipment

Home

Exit

Comprehensive Batteries

- Cognitive Behavioral Driver's Inventory (CBDI) - The Group could not make a recommendation for the use of this tool based on a number of factors:
  - The reaction timer component is no longer available
  - Some sub-components are discipline protected
  - The tool does not include practice trials which results in questionable validity of the results

Some comments were made regarding the complexity of the tasks being a positive factor of this tool.

Home Exit

Comprehensive Pre-Road Batteries

- Driver Risk Index - The Group considered this an optional tool to assess the strategic level
- Driver Performance Test- The Group considered this an optional tool to assess the tactical level

Concerns raised:

- The length of time to administer
- The lack of a French version
- The quality of the videos
- The visual processing speed required

Home

Exit

On-road Assessment-

Recommendation: The Consensus was that all individuals referred for assessment be given the opportunity to complete an on-road segment.

Note: the Group recognized that the on-road might be cut short or include only a "non-traffic environment" for some individuals whose pre-road results suggest a high risk. Rare exceptions where no on-road should be performed - would include those clearly unable to participate in a driving evaluation based on the overall pre-road results.

Home

Exit

On-road Assessment-

The Group reviewed all published existing on-road tests that were found through an extensive literature review.

Recommendation: The Group was not able to recommend a standardized tool for the on-road.

NOTE: It was noted that a number of tools had interesting components or scoring, but no one had all the components perceived as necessary to make a recommendation.

Home

Exit

Closed circuit Assessment-

Recommendation: The Consensus was that a “closed circuit” defined as no interaction with other vehicles, be optional based on the safety risk assessment during the pre-road.

Home Exit

On-road Assessment-

Recommendation re timing: The Consensus was that a 45 to 60 minute on-road evaluation would provide sufficient time to assess the various on-road driving behaviors.

Note : the on-road might be cut short if the on-road driving behaviors suggested a high risk requiring termination.

Home Exit

On-road Assessment- critical components of the route

1. All way stop intersections
2. Left hand turns
3. Right hand turns
4. Stop lights
5. Stop signs
6. Merge that requires increase in speed
7. Lane positioning, changing lanes
8. Driving on roadways requiring varying speeds

Note: consensus that parallel parking was not deemed a safety issue but comments were made that some provinces require it – and it provides valuable information

Home

Exit

On-road Assessment- critical components of the route

9. Yield situation (sign where available)
10. Backing up
11. Following another vehicle

Home

Exit

On-road Behaviors-

1. Speed maintenance at various speeds according to road conditions and signage
2. Maintaining lane position
3. Stopping at red lights, stop signs
4. Not stopping at green lights
5. Merging at appropriate speed with visual scanning and awareness of critical stimuli
6. Appropriate lane positioning during turns

Home

Exit

On-road Assessment- critical behaviors of the client

7. Backing up – awareness of surrounding stimuli by checking behind, both sides
8. Slowing to potential hazards
9. Yielding where appropriate
10. Not spending excessive time at intersection
11. Maintaining driving performance with introduction of "cognitive burden" – example responding to conversational questions from the evaluator
12. Respecting a "space cushion" around the car (e.g. shifting to the left when passing a parked car that extends into the driver's lane)

Home

Exit

On-road Assessment- Outcome

Recommendation: The group recommended that the outcome be classified into 3 categories:

- Pass (performed safely)
- Poor (remediable)/ indeterminate
- Poor (not safe/ non-remediable)

Note: Poor = Not recommended for licensing

Home

Exit

Restricted Licenses

The group did not discuss the issue of restricted licenses.

Home Exit

Appropriate Referrals

Recommendation: The Consensus was that appropriate older driver (age 65 and over) referrals for assessment are those whose health care providers are uncertain about their health-related ability to drive safely.

Including, but not exclusive to…

1. those with medical conditions that impact on functioning changes in vision, hearing, musculo-skeletal, mental or neurological health
2. specific diagnostic groups where driving is frequently affected including:

Home

Exit

Appropriate Referral con't

- Stroke both left and right hemisphere
- Parkinson's Disease
- Mild-to-moderate dementia
- Cognitive decline
- Diabetes with peripheral neuropathy

Home

Exit

Components of the Referral

There was no time to discuss the components of the referral during the meeting. A recommendation will be made by e-mail consultation with the Consensus Group.

Home

Exit

Appropriate Referral con't

Various age cut-offs for routine assessment were also considered.

Recommendation: The Consensus was that routine assessment should not be performed based on age.

Home

Exit

THANK – YOU / MERCI !!!

Survey of Driving Professionals: What Is Being Used for Off- and On-Road Testing?

Nicol Korner-Bitensky
McGill University (Montreal, Quebec)

Abstract

Rationale: Increasingly, health professionals are being asked to participate in screening, case finding and assessment of individuals at potentially high risk for unsafe driving. To date we have no standards in Canada or the United States to guide the referral or assessment process.

Objectives: To identify prevalent off- and on-road driving evaluation practices of health professionals involved in driving assessment.

Subjects: The sample consisted of 112 professionals attending workshops during the four-day 2003 Association of Driver Educators for the Disabled (ADED) annual conference. Respondents came from 37 U.S. states and five Canadian provinces.

Survey of Driving Professionals: What Is Being Used for Off- and On-Road Testing? *... continued*

Instrument and Data Analysis: Information was collected using a Driving Questionnaire first designed in 1998 to collect information on driving evaluation practices. Information was elicited on referral source, typical clientele, common pre- and on-road assessment procedures, failure rates, and use of simulators and driving specific tools. In addition, information on reporting practices and retraining was elicited.

Results: Occupational therapists are the most prevalent health professional group conducting driving evaluations. The average number of years of driving assessment experience is 8 years (range= 0 to 25 years). When asked about their work environment, 60% of respondents indicated that they worked in a rehabilitation milieu and 29% reported working in private practice. Further information on the tools used in the in-house evaluation and information on the on-road practice patterns is described in the presentation. In addition, a comparison of the 1998 and 2003 survey results is presented.

Survey of Driving Professionals: What Is Being Used for Off- and On-Road Testing? *... continued*

Discussion: Interestingly, many of the tools chosen by clinicians are those readily available in everyday practice settings. There was a notable lack of use of driving-specific tools and simulators.

Home

Exit

Survey of Driving Professionals: What is being used for off- and on- road testing

McGill

CR R

REPAR

CanDRIVE

Keeping Safe Older Drivers Driving

Nicol Korner-Bitensky, PhD, J. Bitensky, S. Sofer, M. Hing, I. Gélinas

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Acknowledgements

- This project was funded in part by CanDRIVE, a CIHR funded emerging team
- To Stacey Stevens who facilitated the process at ADED 2003
- To those who graciously took the time to complete the surveys

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Evaluating driving potential in individuals with stroke: A survey of occupational therapy practices

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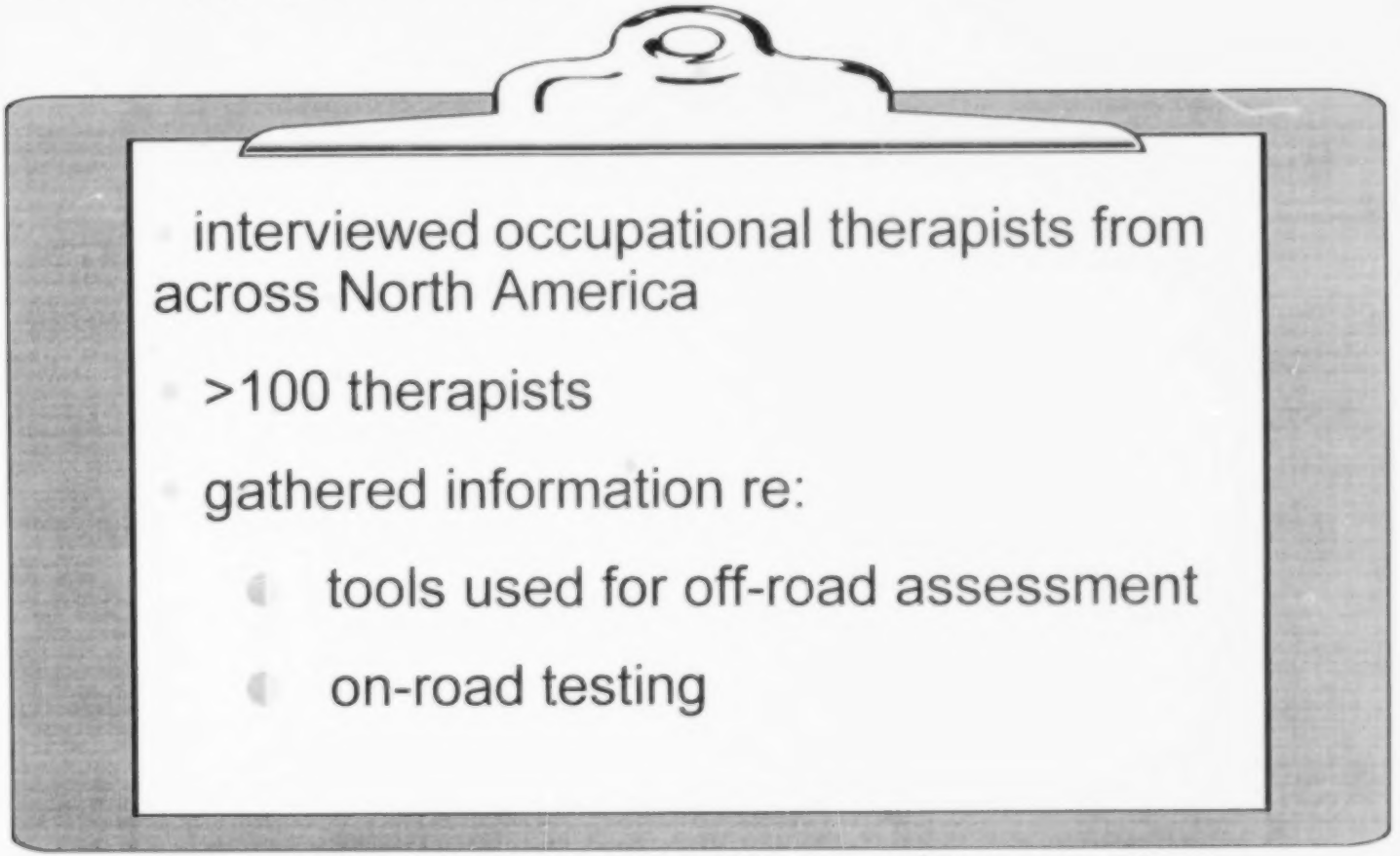

- interviewed occupational therapists from across North America
- >100 therapists
- gathered information re:
  - tools used for off-road assessment
  - on-road testing

N. Korner-Bitensky, S. Sofer, I. Gélinas, B. Mazer
Amer. J. of Occ. Ther., volume 52, number 10, 1998

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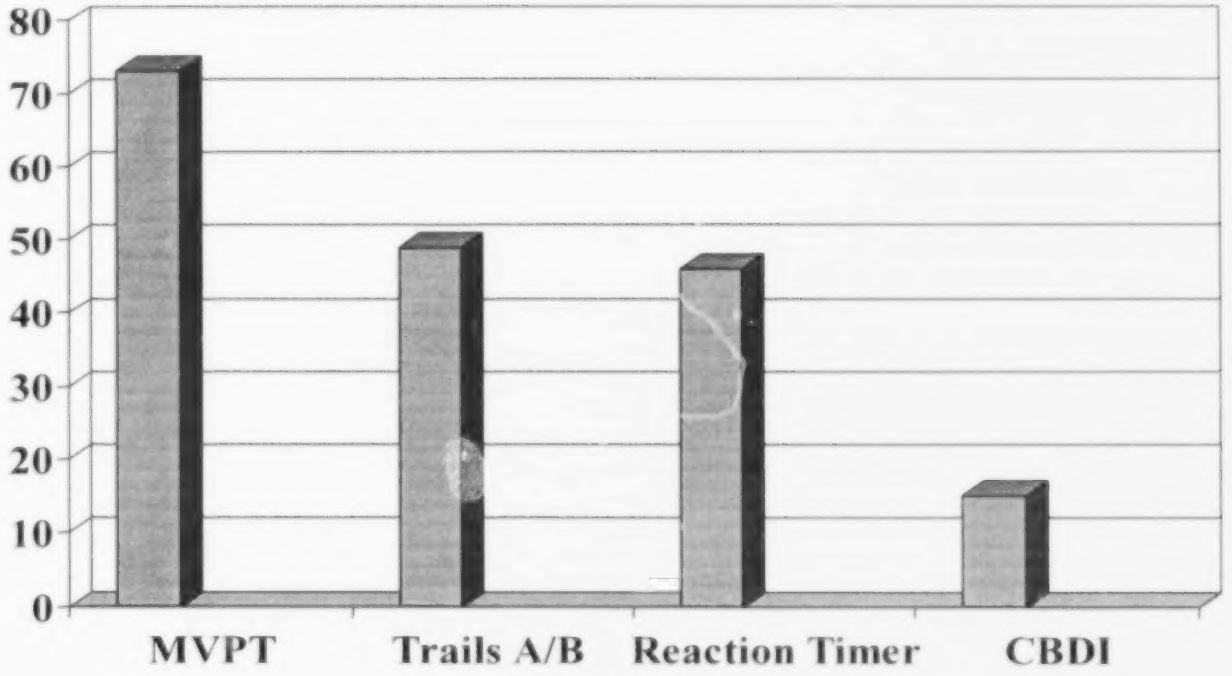
Survey Results

(Korner-Bitensky et al., AJOT 1998)



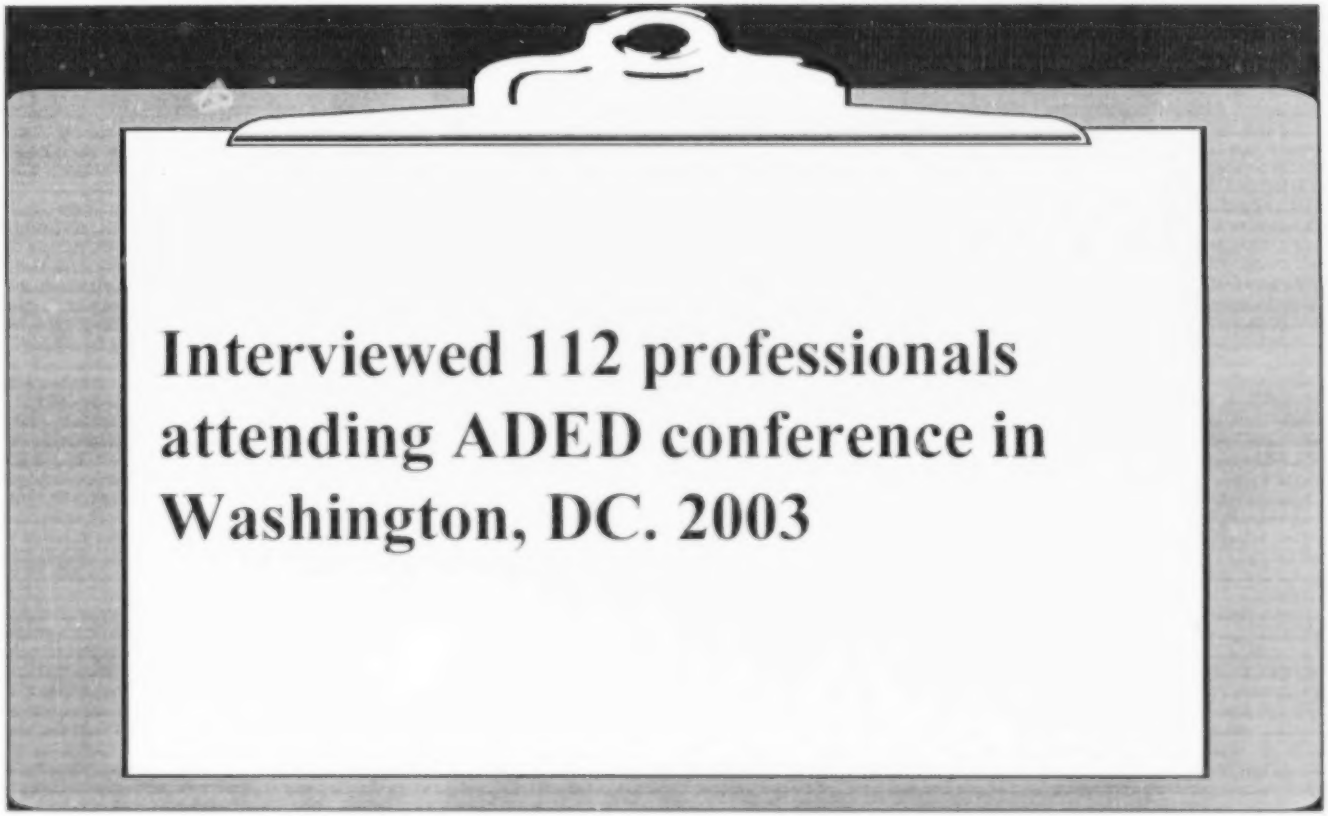
Survey Results

(Korner-Bitensky et al., 1998) continued

What does your on-road driving test consist of?

- **65%** use a standard driving route
- **73%** use a standard evaluation form
- **24%** use a scoring system
- **13%** use a cut-off score for pass/fail

2003 Survey


Interviewed 112 professionals attending ADED conference in Washington, DC. 2003

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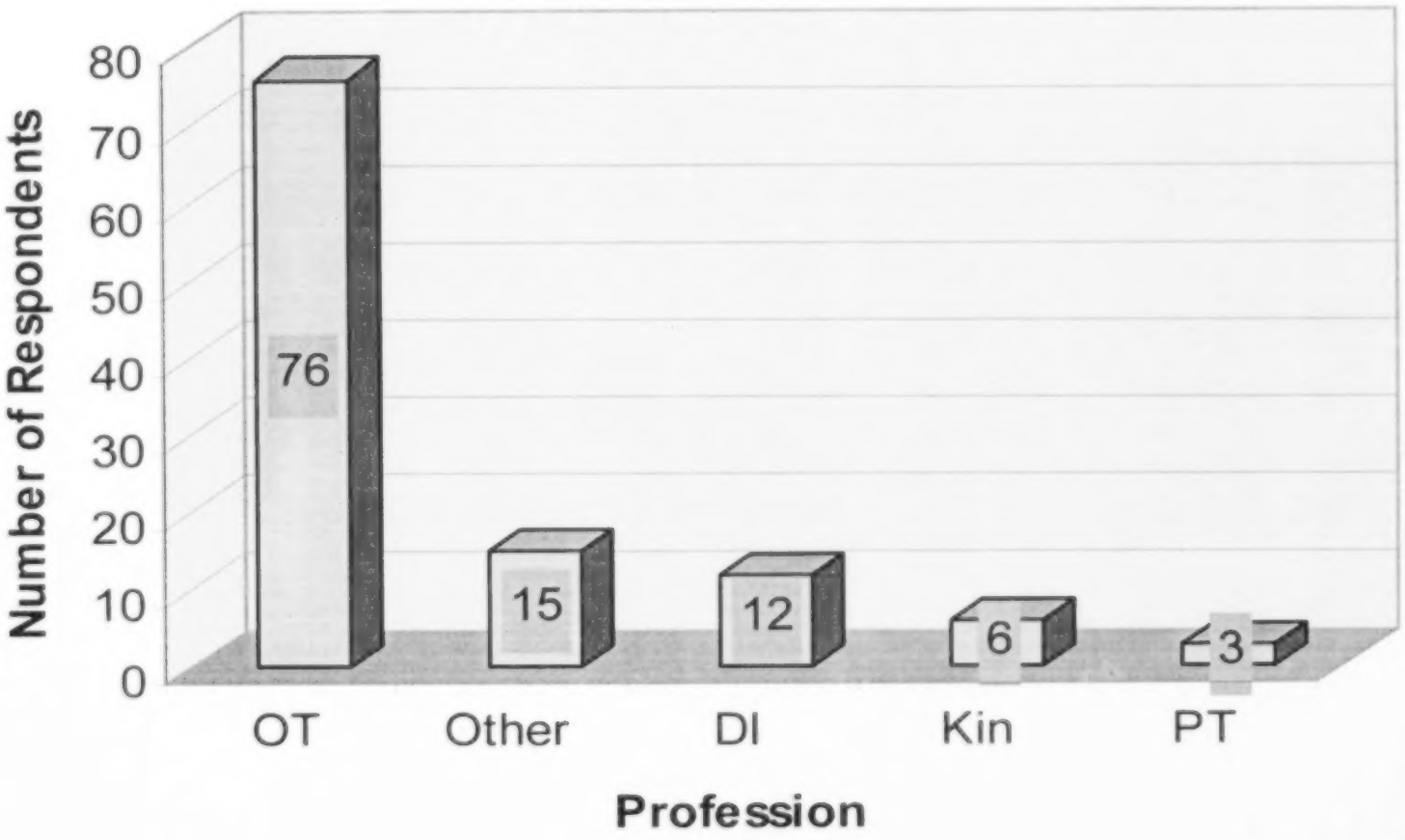
Professional Background of Respondents



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Audience Guess

- The #1 referral source for driving evaluation?

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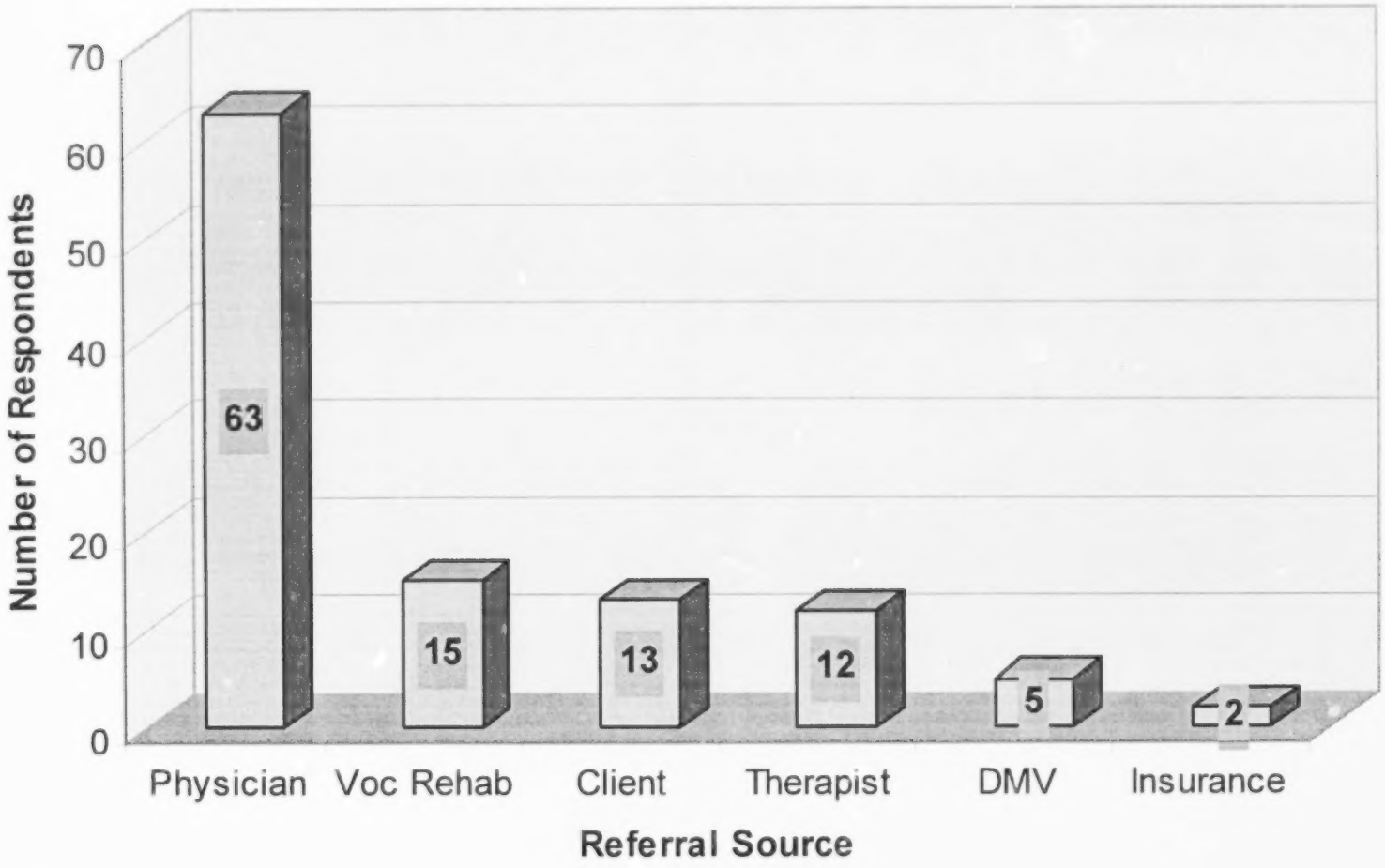
Referral Source



Audience Guess

- The #1 clientele referred for driving evaluation?

Traumatic Brain Injury (97%)
Stroke (96%)
Well Elderly (92%)
Spinal Cord Injury (91%)
Elderly with Dementia (88%)

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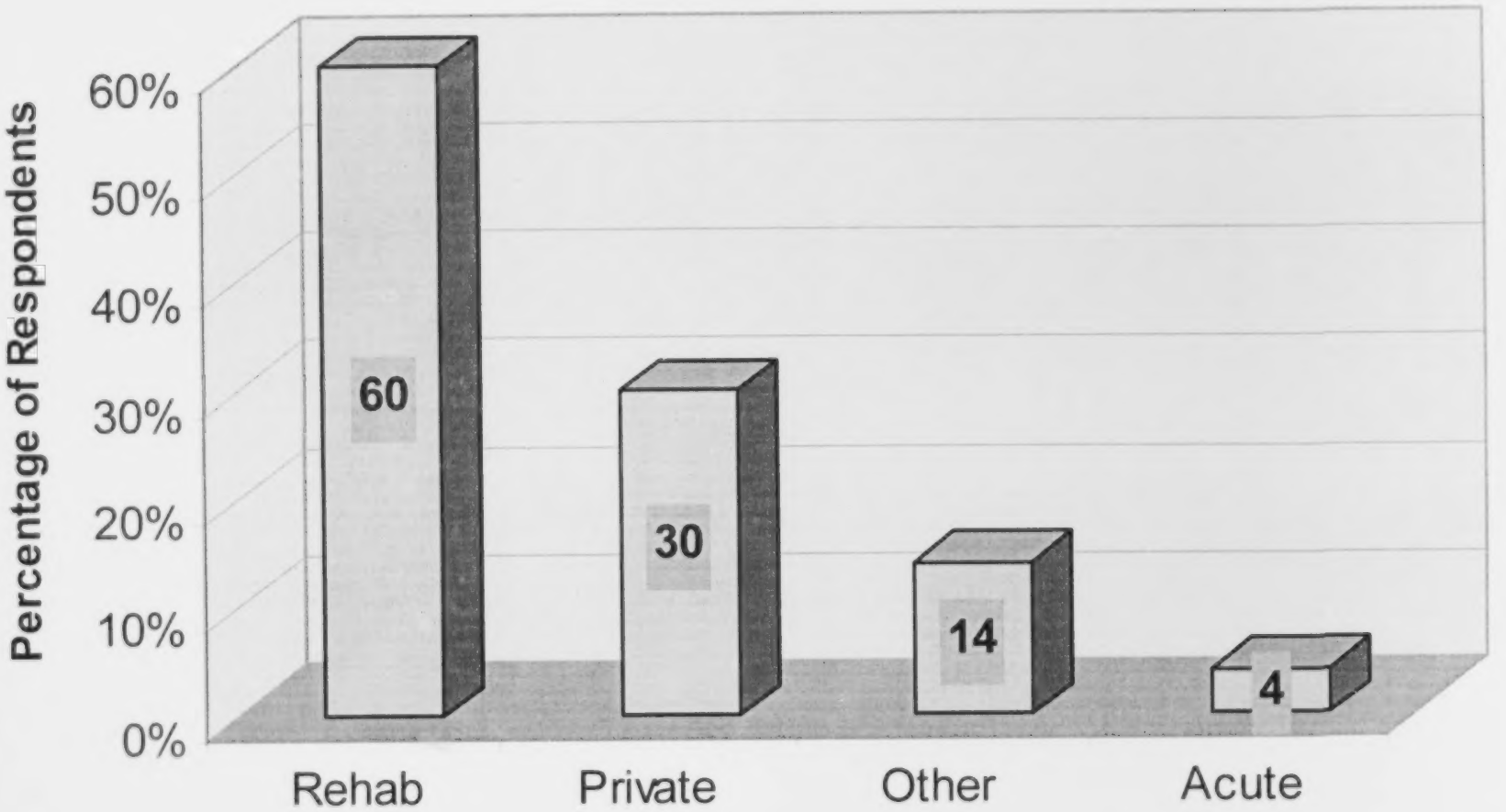
Work Environment of Respondents



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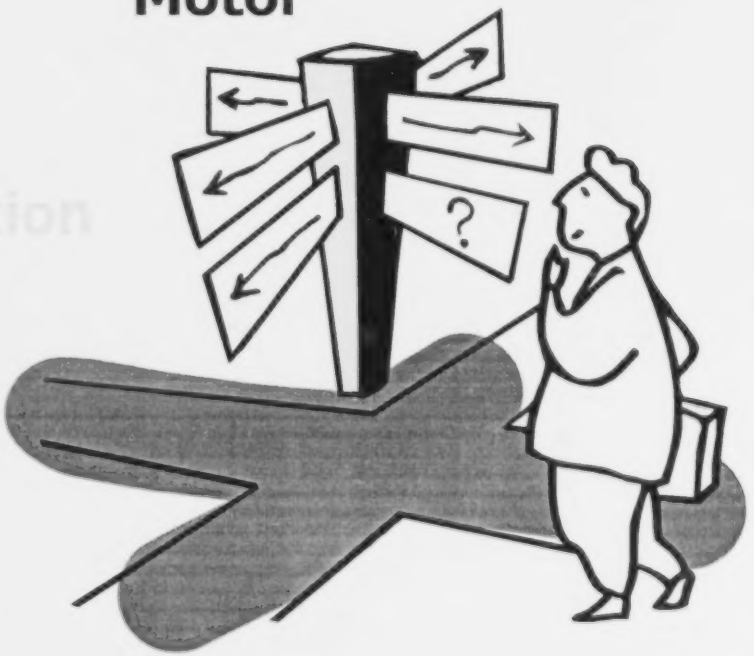
Does your off-road evaluation include…

Motor

Visual-perception

Vision

Cognition



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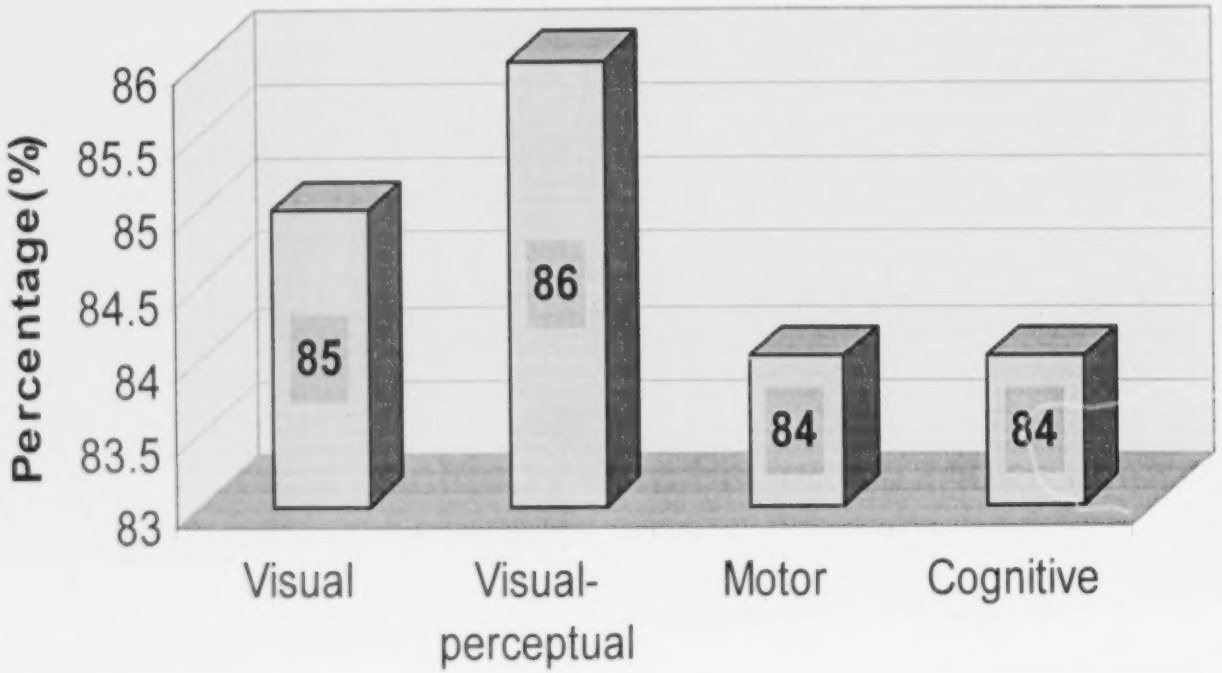
Percentage of Respondents Who Perform Various Off-Road Evaluations



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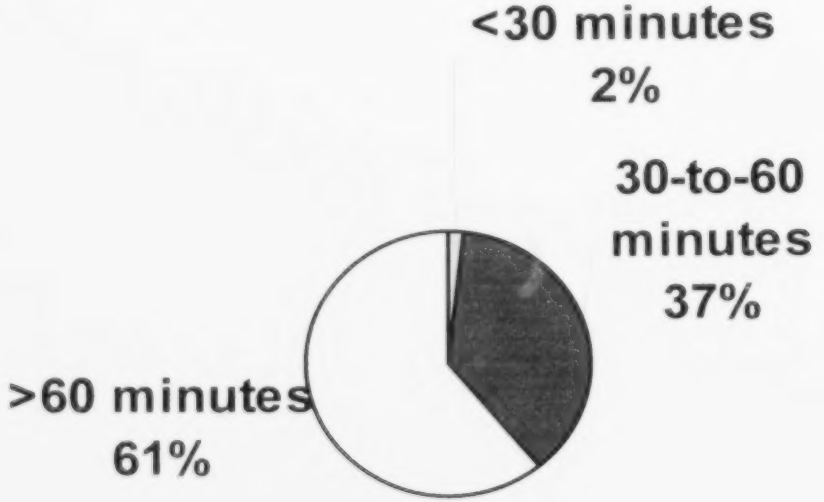
How much time is typically spent on the Off-Road Evaluation?



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Your pre-road evaluation includes...

Trail A/B?

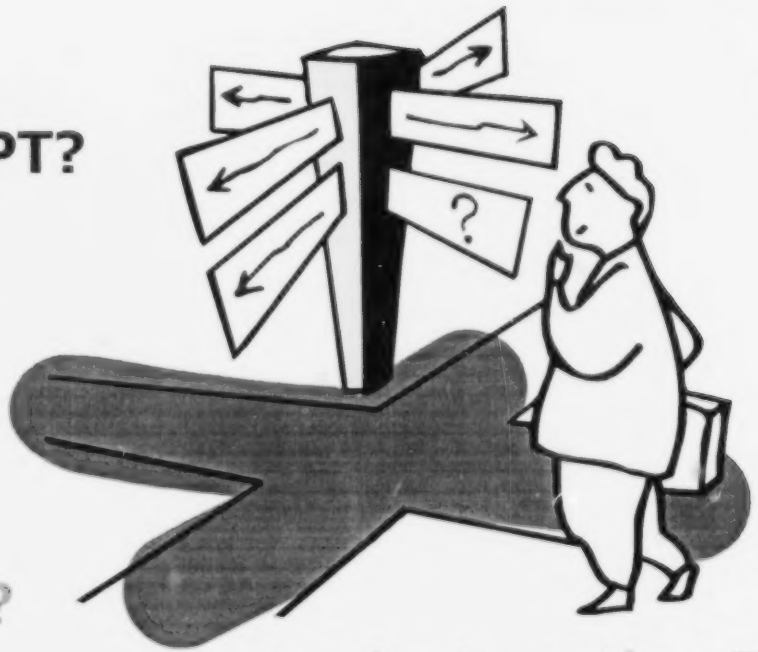
CBDI?

MVPT?

Money Road Map?

MMSE?

Driving Simulator?



DriveABLE Screen

Brake Reaction Timer?

Home

Exit

Audience Guess

- The #1 pre-road driving evaluation used?

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Tests Commonly Used in the Off-Road Evaluation

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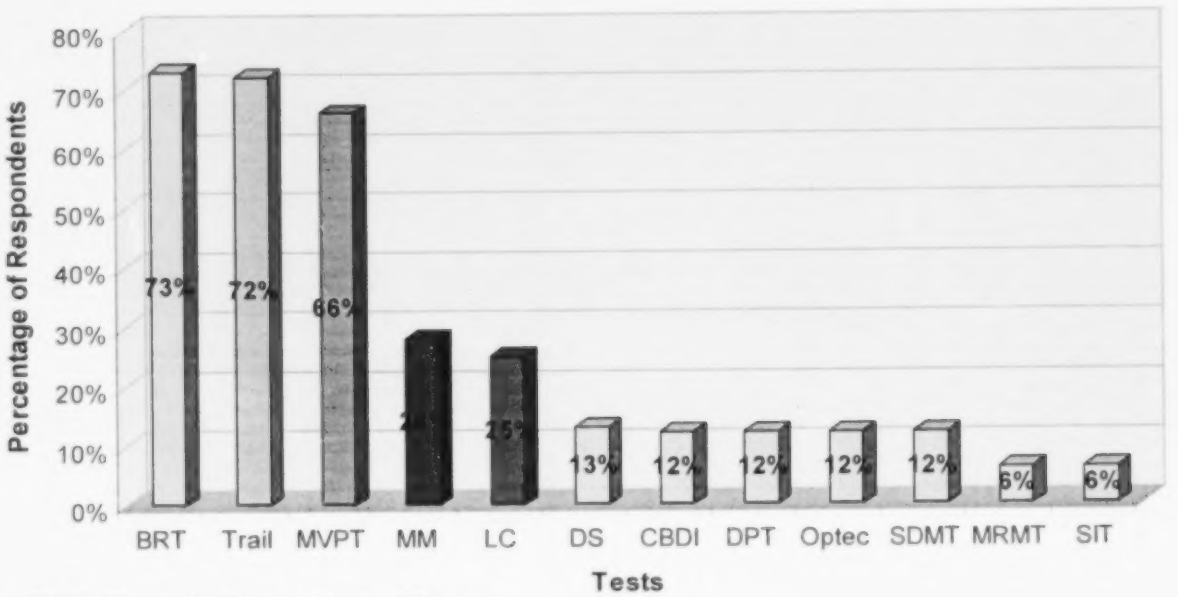


BT: Break Reaction Timer

Trail: Trail A or B

MVPT: Motor Free Visual Perceptual Test

MM: Mini-Mental

LC: Letter Cancellation

DS: Driving Simulator

CBDI: Cognitive Behavioral Driver's Inventory

DPT: Driver Performance Test

Optec: Optec 2000 or 2500

SDMT: Symbol Digit Modalities Test

MRMT: Money Road Map Test

SIT: Sign Identification Test

Home

Are the paper & pencil worth anything in terms of prediction of on-road driving?

Exit

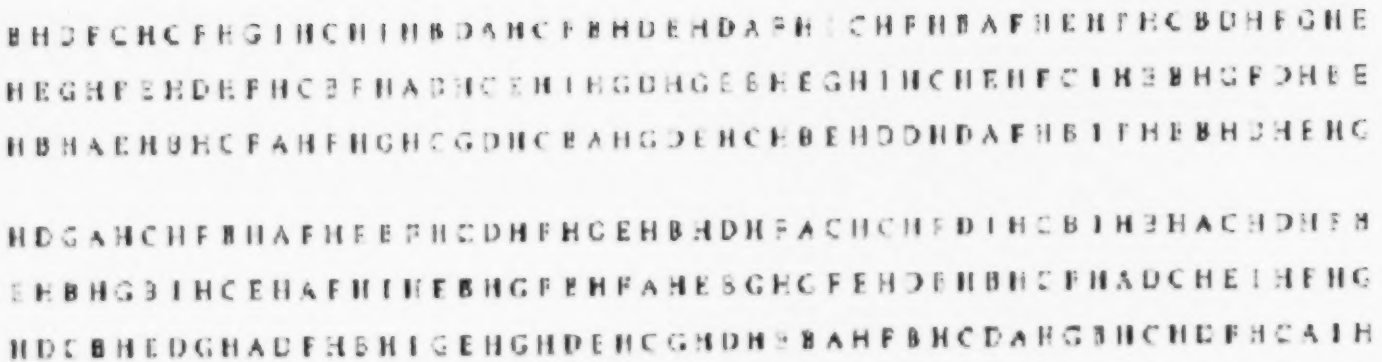
Let us find out.....

Home

Exit

PAPER AND PENCIL TASKS

(Sivak et al., 1984)



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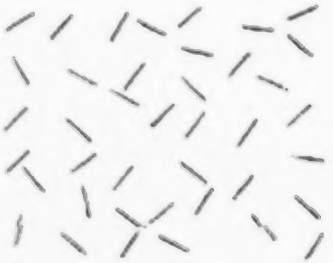
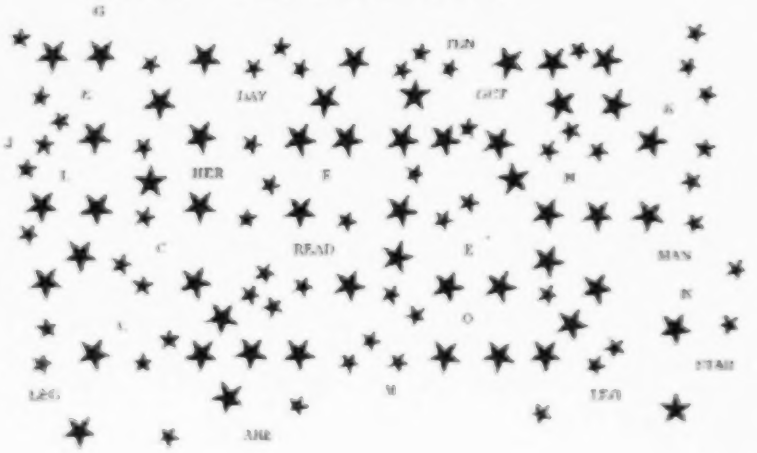
Assessments of Unilateral Spatial Neglect

Albert's Test

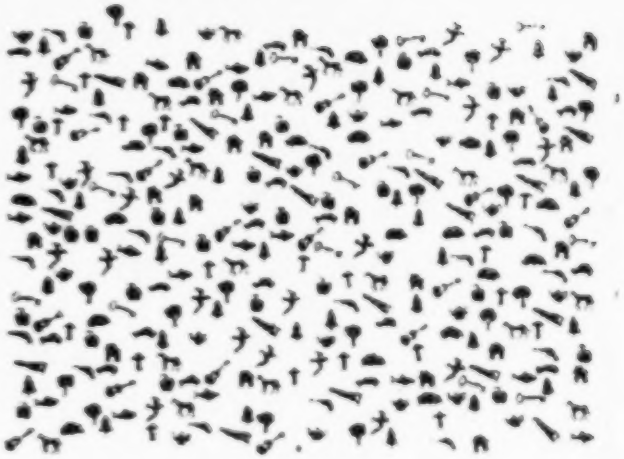


Line Bisection

Star Cancellation



Bells



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Letter Cancellation – and others

Won't cut it!!!!!!

- Patients may go undetected…

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Three Hemispaces (Swan, 2001)

Thank you to Anita Menon, MScOT

- Personal Space

- Near Extrapersonal Space

- Far Extrapersonal Space

Theory supported by neuroimaging studies

(Vallar, 1993, 1994, 1998, 2000; Heilman, Valenstein & Watson, 1994; Bisiach & Vallar, 2000)

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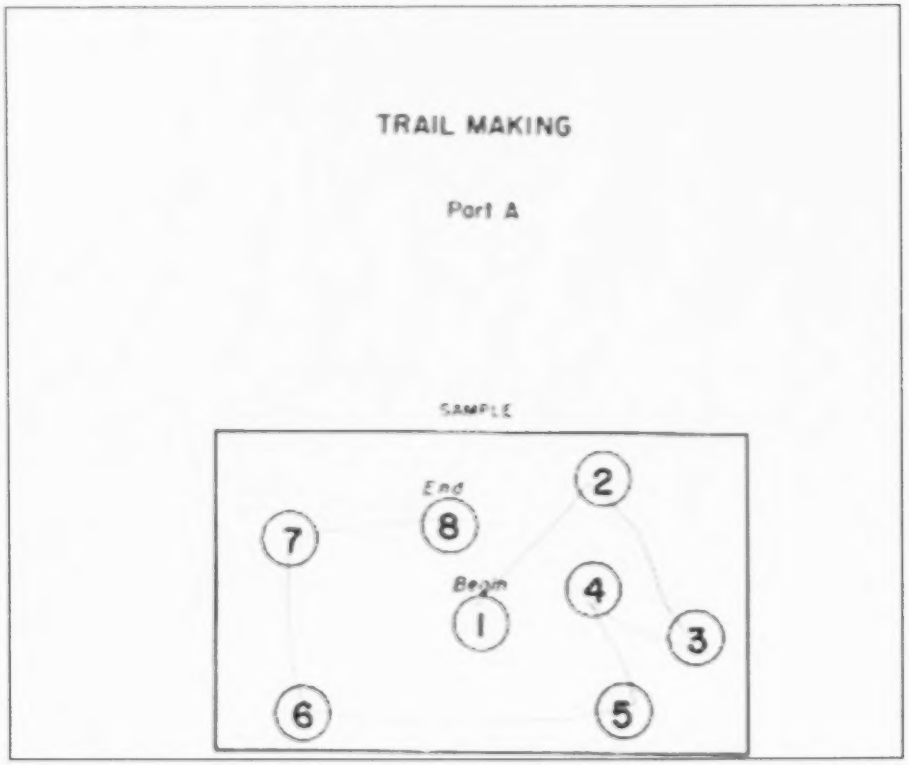
Trail Making Test A & B



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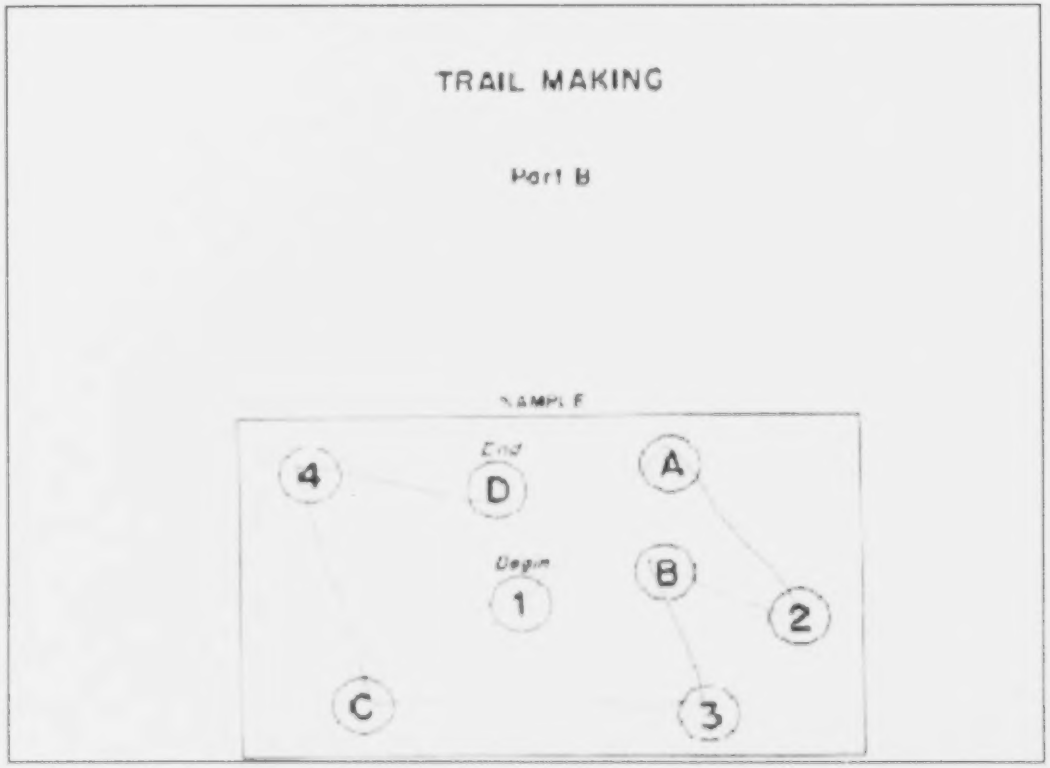
Trail Making Test A & B

- Part B - Visual planning and sequencing



Meta-Analysis:Trails B

- Trails B was examined across studies from 1993 to 1998.
- The effect sizes for these studies were not consistent.
- The average correlation was R=0.30, indicating a moderate relationship between Trails B and crash risk.

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Predictive Value

- examined studies from 1991 to 1999.
- The average correlation with crash risk was:

  R=0.513, for the UFOV®.

  R=0.302 for Trail Making B

  R=0.260 for Mini Mental State Exam

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Motor-Free Visual Perception Test (MVPT)

- spatial relationships
- visual discrimination
- figure ground
- visual closure
- visual memory
- visual perceptual processing time

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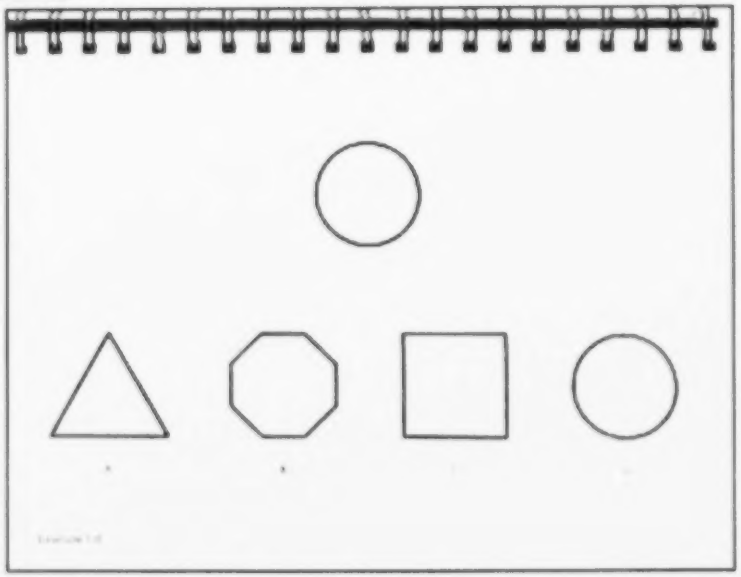

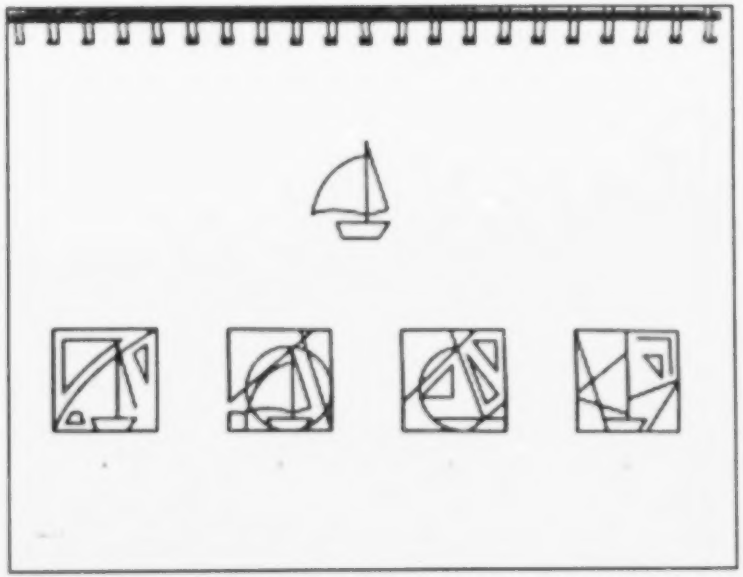

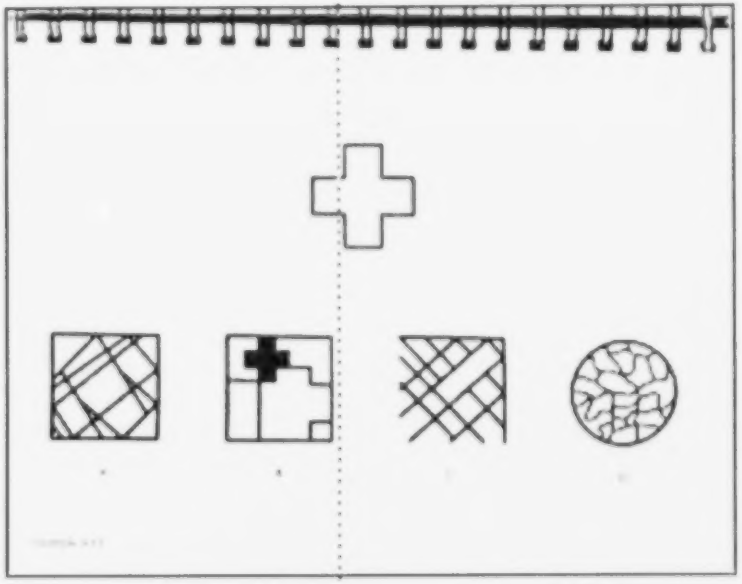

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Prediction of failing a road test based on MVPT results

- **If MVPT $\leq$ 30**
  - **6.4 times** more likely to fail **road test**
- **If MVPT $\leq$ 30 + Trail Making B > 3 errors**
  - **22.4 times** more likely to fail **road test**

Mazer, B, Korner-Bitensky, N, Sofer, S, 1998

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PREDICTION ACCORDING TO LEFT AND RIGHT CVA

- Left CVA

  If Trail Making B $\geq$ 3 errors

  11.5 times more likely to fail

- Right CVA

  If MVPT $\leq$ 30

  15.0 times more likely to fail

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MVPT & DRIVING – study #2

- **Low scores ($\leq$ 30)**
  - predicted failure on the *on-road evaluation*
  - positive predictive value 60.9% not 86.1%
- **High scores (> 30)**
  - are not highly predictive of a pass
  - negative predictive value 64.2% not 58.3%

Korner-Bitensky et al, 2000

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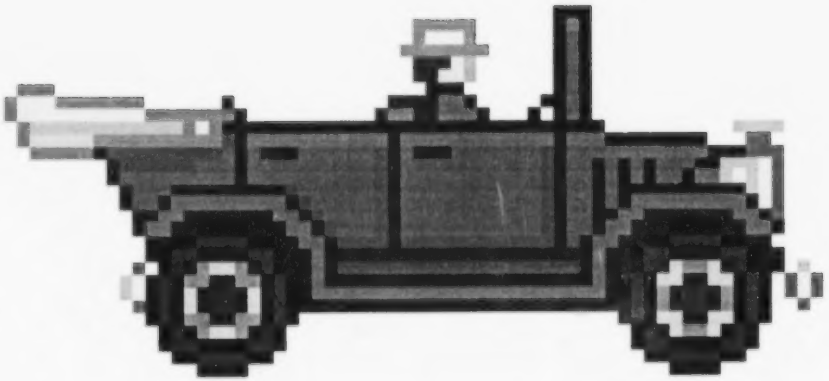
On-Road Survey Results -2003



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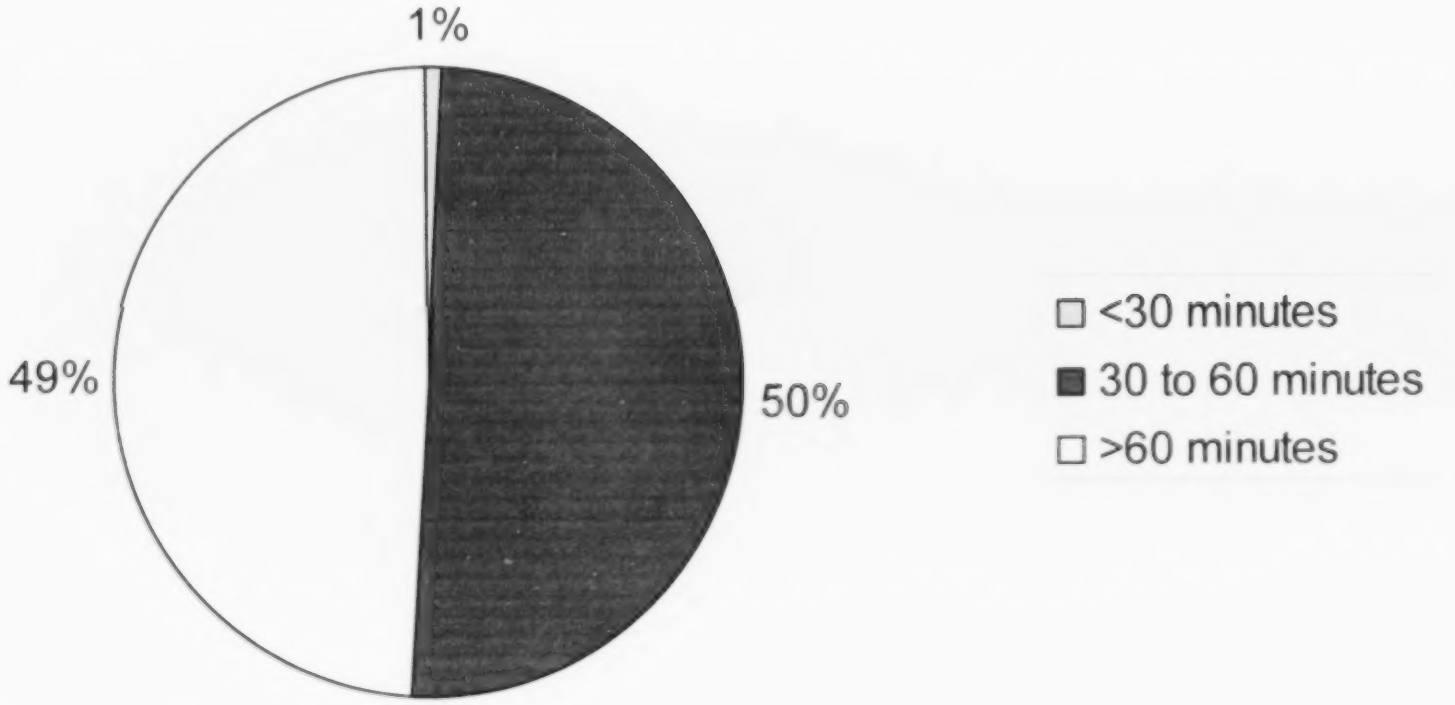
Length of Average On-Road Evaluation



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Question asked	1997		2003		
	Yes	No	Yes	No	Sometimes
Use Standard Route?	65%	35%	74%	20%	4%
Use Standard Scoring?	24%	76%	23%	76%	1%
Use Cut-Off Score?	13%	87%	10%	90%	0%
Subsequent referral to the Motor Vehicle Licensing Agency for a road test?	63%	37%	21%	4%	75%

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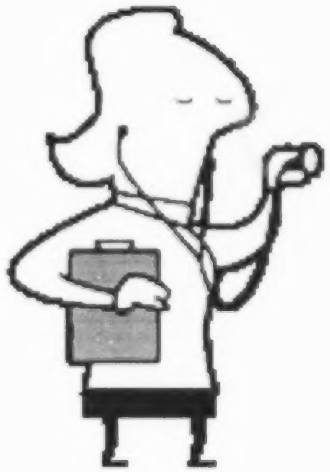
The "Dirty" Job



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Do all your clients undergo on-road testing regardless of the results of the off-road evaluation?

- 94% said yes!

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The "Pass the buck" Strategy

A dangerous way to go....

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What do we know about clients and their judgments about when to stop?

Exit

- 37% of those with intermediate cognitive test performance were still driving (Valcour et al, AGS, 2002)
- 23.1% of those with poor cognitive test performance were still driving
- medical conditions were most common reason for self reported driving cessation,

  !! The more medical conditions a driver had the less likely he was to have stopped driving (Dellinger et al, AGS, 2001)

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Conclusions of this survey

- Most clinicians interviewed were using simple paper and pencil tools
- Few are using simulators or driving-specific off-road evaluations
- Most clinicians conduct both an off- and on- road evaluation
- Little has changed in the 5 years

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To a future when...

Clinicians use predictive tools with known predictive value

"Preserving the driving privilege of those who can"

Driving Simulation: A Pilot Study of Persons with Brain Injury and Matched Controls

Erica B. Stern
University of Minnesota (Minneapolis, Minnesota)

Abstract

Purpose: This study investigated the discriminant potential of the STISIM Drive, a lower-cost, personal computer (PC)-based driving simulator. The study compared simulated driving performance of 5 persons with brain injury and 5 non-disabled age/sex matched persons.

Method: Subjects were given an orientation drive to familiarize them with simulator control and road representations. Subjects then drove a 19-mile, 40-minute long simulation. The route included horizontal and vertical curves, traffic, traffic control devices, and 2-, 4-, and 6-lane roads. Subjects were asked to maintain speed and lane control while interacting with other traffic and responding to traffic control devices. Driving challenges included

vehicles cutting off the driver or ignoring traffic signals, potential head-on collisions on two-lane rural roads, and slower traffic forcing passing decisions.

Results: All subjects with brain injury demonstrated at least one dangerous or illegal error (running off road, crashing into an object, or going through a stop sign). No normal subject made any such errors. During specific challenging events, brain-injured subjects used simpler strategies and were more impulsive than normal subjects. During the simulation, persons with brain injury demonstrated poorer control on curves, more crashes, more illegal behaviours, simpler strategies during challenging driving situations, and greater impulsivity than normal subjects.

Conclusions: The pilot data tentatively indicate a role for driving simulation in pre-driving screening of persons with brain injury, especially if its face validity can be improved in specific critical areas.

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Driving Simulation: A Pilot Study of Persons With Brain Injury and Matched Controls

Erica B Stern, PhD, OTR/L, FAOTA, U of Minnesota
Elin Schold Davis, OTR/L, CDRS – AOTA
William K Durfee, PhD – University of Minnesota
Theodore J Rosenthal – Systems Technology, Inc.
Jerry Wachtel – Veridian Group

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Background

- Dilemma: How to safely provide cognitive challenges related to driving?
- Interested in driving simulation to:
  - Provide realistic outcome to driving actions (feedback in driving screening)
  - Safe "structured failure" to improve self-awareness of driving deficits
- Simulation is **not** a solution. It is one potential tool for use in combination with other tools and methods

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Simulator Weaknesses

- Low-cost systems are not "just like real" – they
  - Present simplified visual environments
  - Lack motion cueing
  - Unable to simulate all potential roadway designs, objects and situations
  - Have only beginnings of validity/reliability established
- Not a toy or game
  - Requires average to above average computer capabilities
  - Steep initial learning curve

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Simulator Weaknesses (cont.)

- Scripting repeatable events is tough
  - Human operator is unpredictable
  - Roadway objects only do what they are told and can interfere with other objects in the scene
- Simulation sickness

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Simulator Strengths

- Mimics the overall driving environment
- Safely allows drivers to experience critical/dangerous driving situations
- Relatively low-cost :
  - PCs running Windows
  - Off the shelf components
  - Easily upgraded (both hardware and software)
- Customizable scenarios to meet user specific requirements, driving situations, and data needs

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Funded Study Via

- **National Institute of Health:**

  STTR grant – Small business and a non-profit (university, government organization, etc.) combine technology to create a product

- **Phase I**
  - Feasibility study of proposed approach
  - $100K, 12 month award

- **Phase II**
  - Full research and development effort including building a prototype and all necessary data collection/analysis
  - $500K max., 2 year award

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Project Aims

- Customize STISIM Drive® driving simulator for assessment of drivers with mild to moderate cognitive impairment from BI
- Develop simulator scenarios with a range of real-world driving challenges
- **Compare performance of brain injured and non-disabled persons on simulator to see if performance differentiates/discriminates**
- Compare concurrent validity of on-road drive and simulation
- Describe effects on-road and simulation have on self awareness of deficits

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Subjects

N= 5 with brain injury (BI)

3 women 2 men

4 completed drive (migraine)

Age M=40.4 y/o, range 29-54

Mild - Moderate ↓ per **COGNISTAT**

Post-injury M= 1.9 yrs, s.d.=1.34

N=5 Control (non-BI)

Matched to BI sex & age, +/- 5 yrs

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Exit

Instrument
STISIM Drive®

Home

Exit

Drives

- **Orientation**
- **Low challenge** (1st half)
  - Maintain speed & lane position
  - Start & stop
  - Move with other traffic
- **High challenge** (2nd half)
  - 6 critical events

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Orientation Drive

- Drove until comfortable (5-10 min)
- Introduce look & feel of roads, traffic, signs
- Practice vehicle control
- ↓ incidence & intensity of simulator sickness

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Low Challenge Drive

- 19 'miles' of 2 lane residential, 4 lane, business & 4-6 lane highway
- 40 min at posted speed
- Traffic flow in subject's & on-coming lanes
- Required subjects:
  - maintain speed & lane position
  - start & stop
  - move with other traffic

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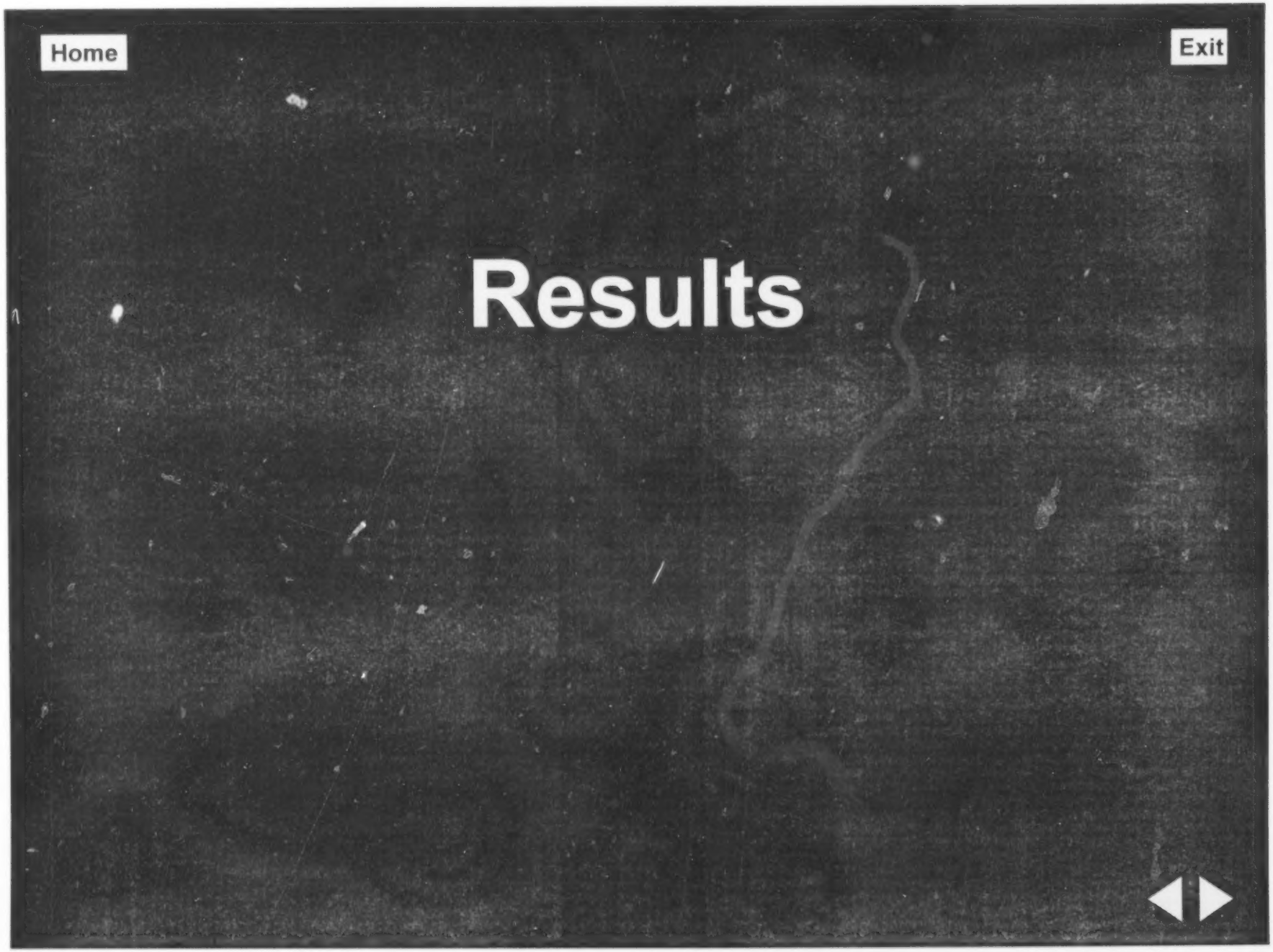
Exit

High Challenge Drive

- All Simple Scenario elements PLUS
- 6 lane limited access highway
- 6 Critical events
  - Car into subject's lane from shoulder without signaling
  - Car running red light
  - Car running stop sign
  - Oncoming car passing, potential head-on collision
  - Car driving below posted speed, blocked passing
  - Car approaching in L lane of 4 lane road, subject told to make L turn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Results

Home

Exit

Steady State Data

- Data from 2 straight & 4 curved road segments (2 early & 2 later in drive)
- Subjects **not** differentiated by
  - Speed :
    - All subjects had difficulty controlling speed.
    - All subjects went >5 mph faster or slower than posted speed for ≥5 continuous seconds for >15% of the road segments
  - Lane maintenance on straight road:
    - All subjects maintained lane– improving in centered positioning across drive
    - Mean lane position similar across all subjects

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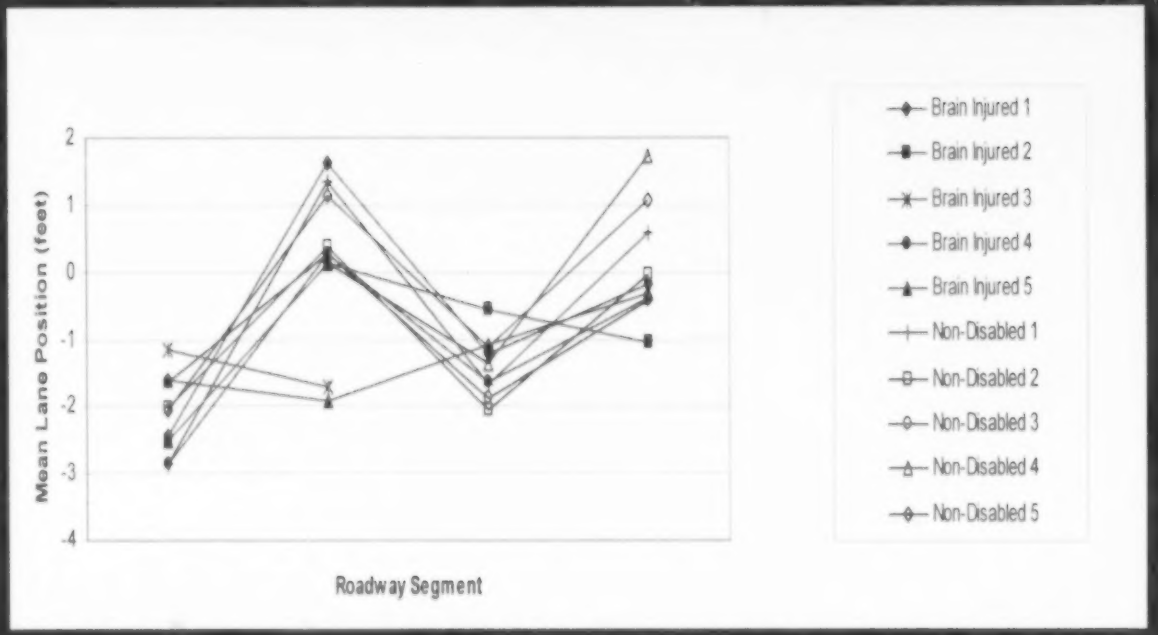
4 curves (left-right-left-right)



Finding:

- Control subjects alternate lane position depending on curve direction;
- Subjects with BI - lane position is wider, more variable and tends toward left of lane regardless of curve direction

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3 Critical Events Differentiate Subjects

- Car into subject's lane from shoulder without signaling
- **Car running red light**
- **Oncoming car passing, potential head-on collision**
- **Car driving below posted speed, blocked passing**
- Car approaching in L lane of 4 lane road, subject told to make L turn

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Exit

Situation 1: **Running a Red Light**

A vehicle driving on a crossroad fails to stop for a red traffic light

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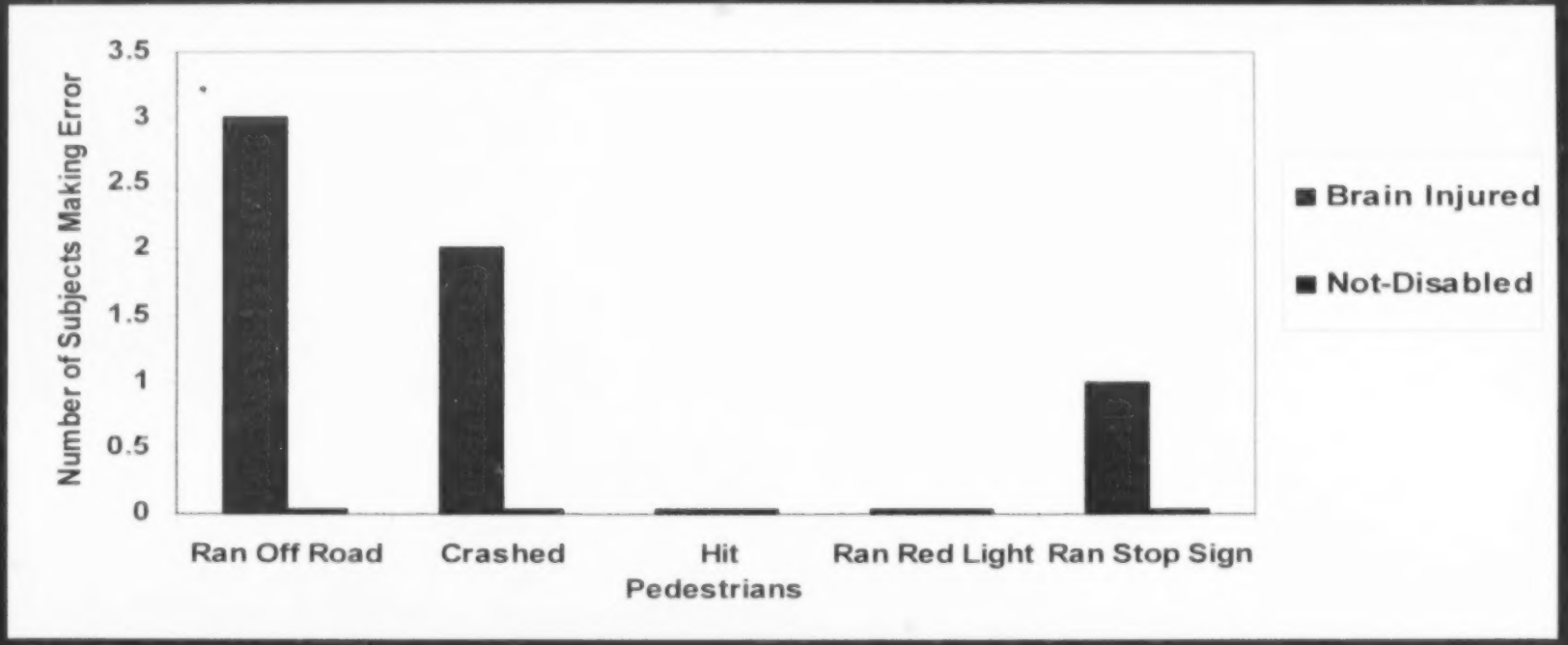
Ticketable Offenses



Finding: All subjects with BI made ≥1 ticketable driving error. No Control subject made any of these errors.

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Situation 2: Potential head on-collision

Driving on left curve, 2 lane road

Oncoming bus hiding a car behind

Hidden car pulls out and begins legal pass

Potential head-on collision

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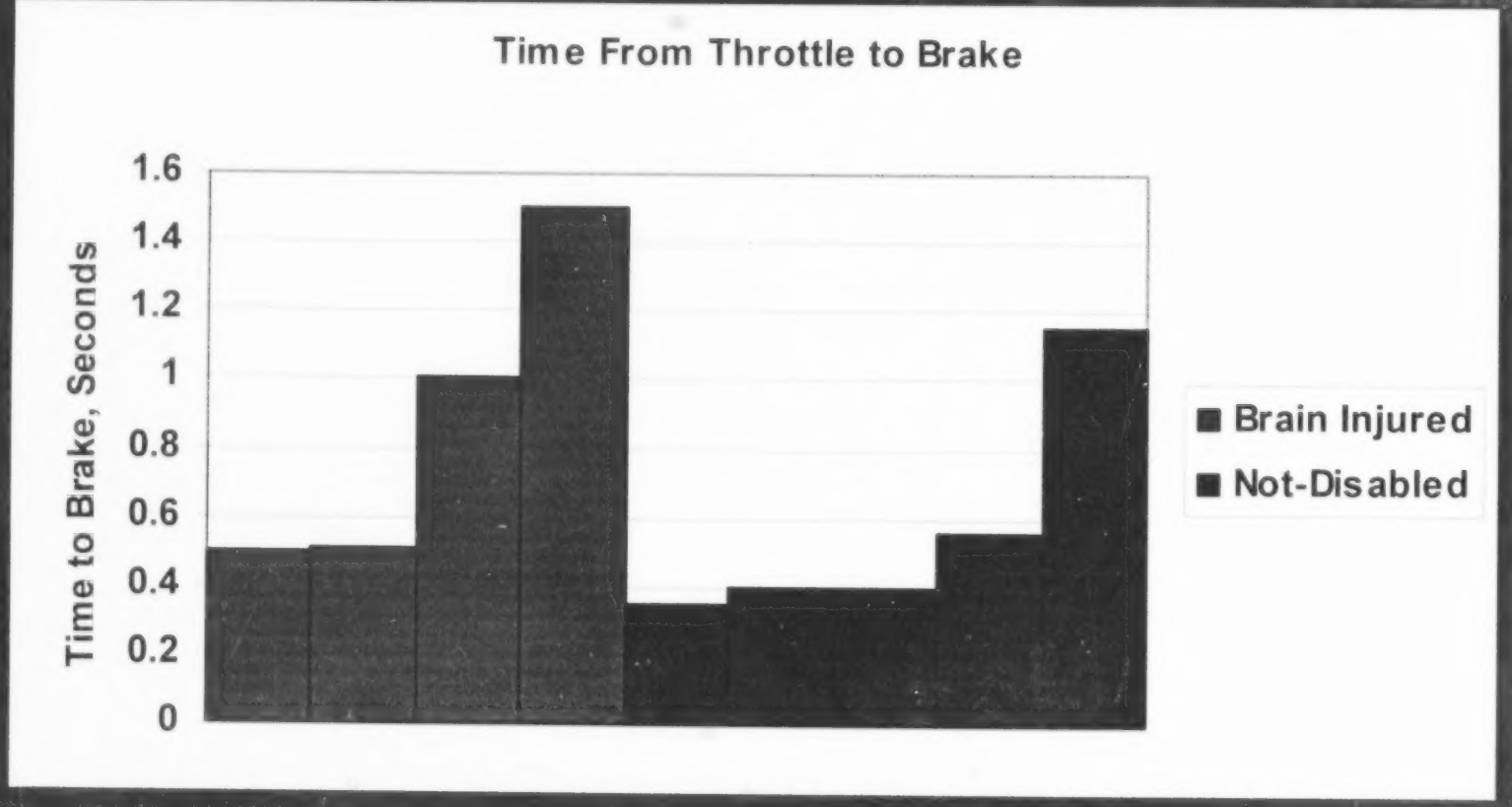
Situation 2: Braking results



Finding: Subjects with BI took longer to brake

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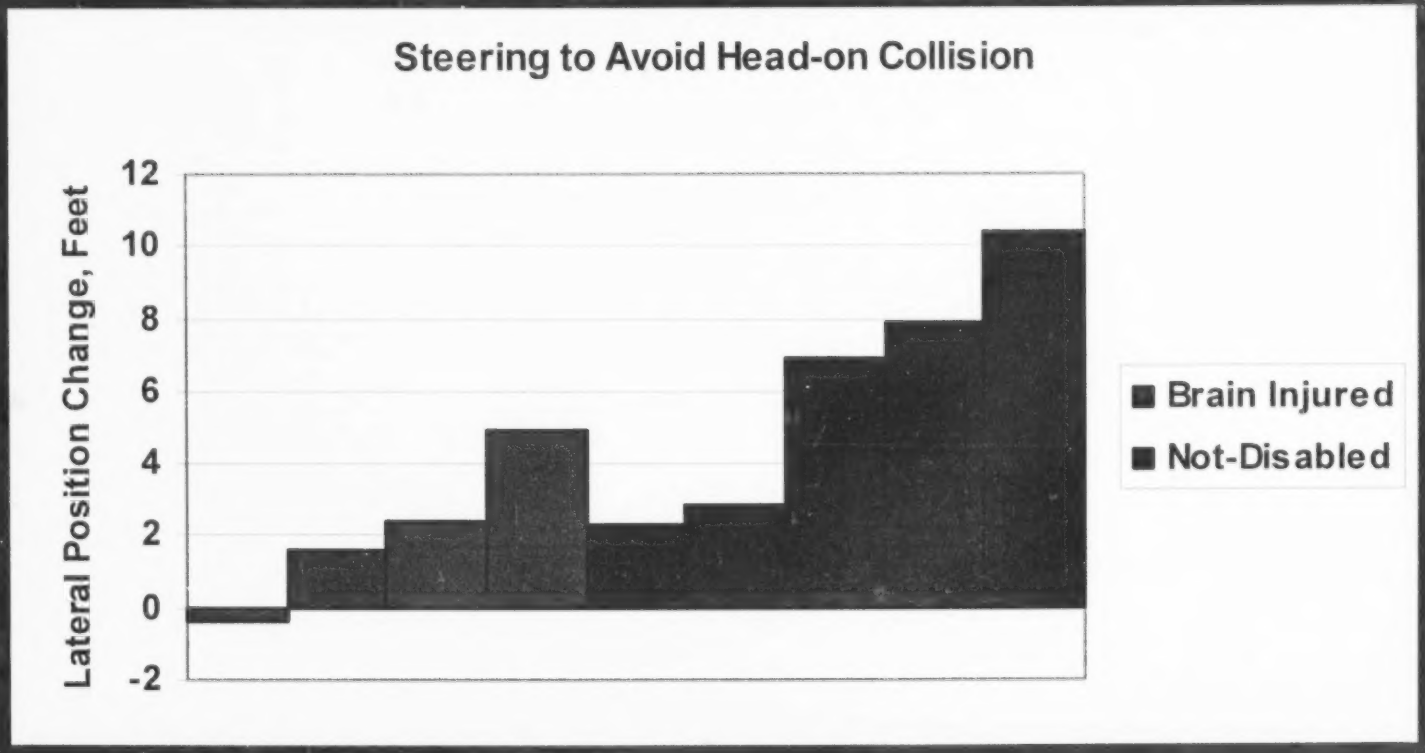
Situation 2: Evasive Steering Results



Finding: Subjects with BI used less effective steering

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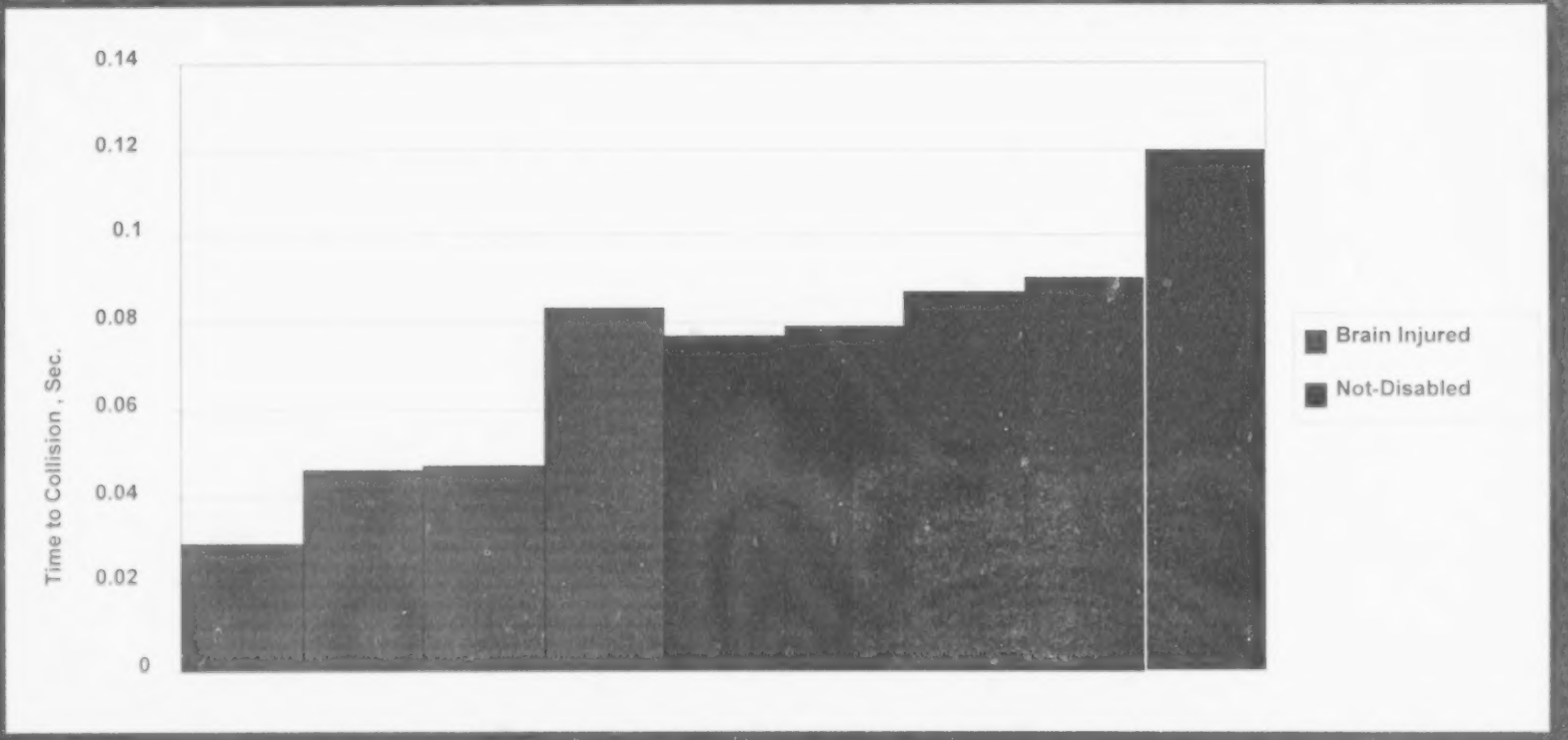
Situation 2: Time to Collision



Finding: Subjects with BI came closer to collision than Control

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Situation 3: Impulsivity

Car driving dramatically below posted speed for several minutes where street markings prohibit passing

Street markings change to permit passing, but oncoming cars make this less safe

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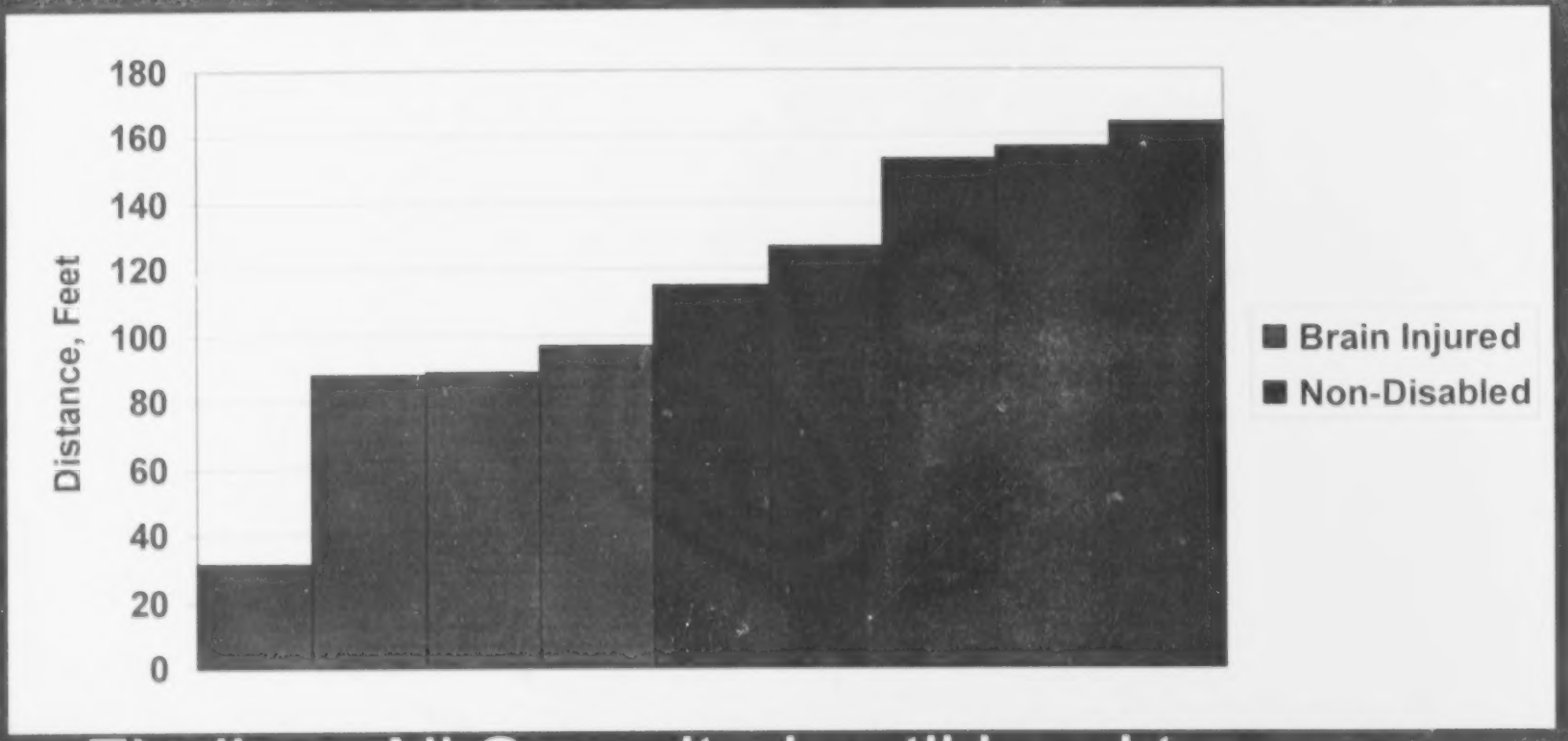
Situation 3: Distance Before Passing



Finding: All Ss waited until legal to pass

Subjects with BI passed sooner, in presence of oncoming cars.

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Summary

- VERY SMALL STUDY!!!
- Compared to age/sex matched Control subjects, subjects with BI showed
  - more illegal offenses,
  - simpler strategies during challenging situations
  - greater impulsivity
- Current driving simulation challenge scenarios may be able to differentiate people with BI from those without, especially if face validity can be improved in critical areas (i.e., representation of speed, ease of turns) and ease of analysis improved.

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Current Work

- Conducting multi-center study to determine:
  - Test-retest reliability
  - Discriminant validity
  - Concurrent validity to on-road test
  - Treatment effects of simulation-based driving on self-awareness of driving deficits

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Thanks to:

- **Our subjects** for their participation & insight
- **Tricia Martinic, OTR/L** for her assistance in data collection
- **Jennine Spiers, MD** for serving as study medical director
- **Sister Kenny Institute/Abbott Northwestern Hospital** for providing personal and indirect support

- **This project was funded through a US National Institutes of Health STTR grant #1R41HD37287-01**

Driving Simulation as a Means of Altering Self-Awareness of Deficits in Persons with Brain Injury

Erica B. Stern
University of Minnesota (Minneapolis, Minnesota)

Abstract

Brain injury can permanently impair the cognitive skills needed for safe driving and the metacognitive skills needed for realistic self-appraisal of driving abilities and deficits. Unlike on-road driving, where risks to life and property must be tightly controlled for the well-being of all, driving simulation offers opportunities for "no-cost therapeutic failure". Our clinical experience indicates that driving simulation, combined with therapist feedback, can be a useful therapeutic tool to improve client insights regarding deficit driving behaviours and skills, and to improve client willingness to participate in further training or follow driving restrictions.

Driving Simulation as a Means of Altering Self-Awareness of Deficits in Persons with Brain Injury

... continued

This presentation describes:

1. how driving simulation is being clinically used at the Sister Kenny Institute in Minneapolis to improve self-awareness of deficits in persons with brain injury;
2. the current validity and reliability studies of a driving self-awareness instrument; and
3. the methods and preliminary findings of a federally funded blinded study of therapist feedback and STISIM driving simulation's therapeutic benefits and limitations.

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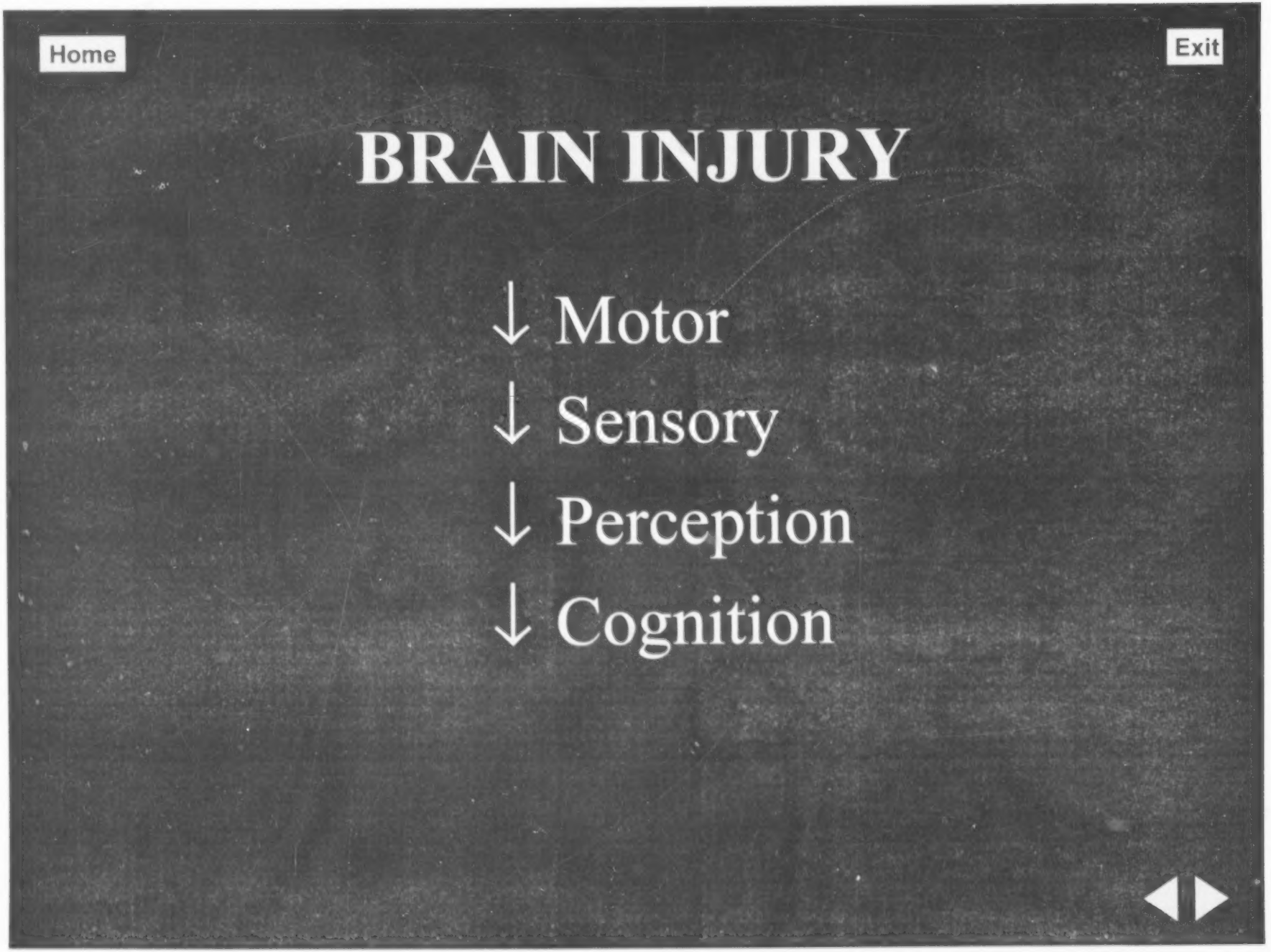
Driving Simulation as a Means of Altering Self-Awareness of Deficits in Persons with Brain Injury

Presenter: Erica Stern, PhD, OTR/L, FAOTA
Associate Professor – University of Minnesota
Contacts: stern001@umn.edu 612 626-2799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BRAIN INJURY
↓ Motor
↓ Sensory
↓ Perception
↓ Cognition

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Brain Injury

↓ Metacognition

Defined as:

- Knowing what one knows
- Self-awareness
- Insight

Process of:

Integrating external reality with inner experience

Ability to perceive self in accurate terms

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Models of Self-awareness

- Crosson et al. (1989)
  - ➢ Intellectual awareness
  - ➢ Emergent awareness
  - ➢ Anticipatory awareness

- Toglia & Kirk (2000)

Metacognitive:

- ➢ Knowledge of one's abilities

On Line Awareness:

- ➢ Ongoing, current awareness of actual performance in task

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Models of Self-awareness (cont.)

- **Birnboim (1995)**
  - Understanding own abilities & deficits
  - Understanding characteristics of task
  - Understanding strategies for each task
- **Fleming and Strong (1997)**
  - Awareness of specific deficits
  - Awareness of functional implications of deficits
  - Ability to set realistic goals/predict future state accurately

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Categorizing Self-awareness (continued)

- Allen and Ruff (1990)
  - self-awareness – ability to attend, encode, & retrieve information concerning own action
  - appraisal – comparison of current behavior to target (past knowledge of self)
  - disclosure – willingness to report self-perceptions to others accurately & honestly

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Persons with Impaired Self-Awareness

↓ Motivation

↑ Resistance to treatment

↓ Outcomes

Confused by disapproval, anger or other response to inappropriate action

↓ Compliance with restrictions (general)

↓ Decision making

↑ Incidence of unreasonable risk taking

Sherer et al., 1998; Flemming, Strong, & Ashton, 1996; Bergquist & Jacket, 1993; Newman, Garmoe, Beatty, & Ziccardi, 2000 ***Rocchio, 2000***

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Impact of Self-Awareness

- Admission level of self-awareness best predictor of vocational status 6 mo post-dc (Ezrachi et al., 1991). Others found no significant correlation between insight & vocational outcome (Johnson, 1987)

- Head injured patients with better self-awareness performed better in treatment (Lam, et al, 1988) Others found no significant correlation between insight & rehabilitation gains (Herbert & Powell, 1989; Malia, et al., 1993)

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Self-Awareness Impact (cont.)

- Improved levels of self-awareness associated with higher levels of emotional dysfunction
  (Godfrey, et al., 1993; Fleming, et al., 1998)

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Driving and Self-awareness Alzheimer's

- Correlational Study
- No significant relationship between MMSE: driving status
- Concluded that AD patients failed to self-restrict driving it was often associated with:

  ↓ awareness of attention deficit
- Awareness of a driving performance deficit may be critical to restricting driving performance, and thus enable patient to prolong status as a driver.

Cotrell and Wild (1999)

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Driving and Self-awareness Visual Impairment

RCT Intervention: Tx= SCT-based; info on vision, risk recognition and strategy, peer testimony

Findings- Compared to Control group, Tx group:

- Saw self as more visually impaired & greater impact
- Perceived more benefits to self-regulation
- Moved closer to readiness for driving self-restriction

Conclusion: ↑ driver's self-awareness of visual impairment → adopt self-regulate to reduce/avoid high risk driving

Stalvey & Owsley (2003)

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Driving and Self-awareness Brain Injury

- In a comparison of self-assessment and rater assessment persons with BI judged their simulated drive more positively than rater and had even higher self-rating (compared to rater) re. an on-road drive (Huchler et al., 2002)

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Ways to Assess Self-Awareness

- Compare person's self-estimate to "gold standard" other individual
  - Patient Competency Rating Scale (PCRS)
  - San Diego Questionnaire (SDQ)
- Compare what a person acknowledges to a 'gold standard' reviewer's perception
  - Self-Awareness of Deficits Interview (SADI)
- Compare person's self-estimate on a specific task to external reviewer's assessment or performance criteria on that task

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Patient Competency Rating Scale

- 30 items – of daily behaviors
- Rated 1 (can't do) -5 (can do with ease)
- Patient self-rating compared to caregiver (also a therapist version)
- Scored in several ways:
  - Compare average perceived scores
  - # items patient>rater; # pt = rater, #patient <rater. Pt classified per highest score
  - Total magnitude and direction difference (+/-) for each item

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San Diego Questionnaire

- 29 items (6 factors of COGNITION: sensorimotor, attention, language, arithmetic, learning/memory, & logic)
- Rate as 1 severe problem to 4 no problem/no strength to 7 definite strength
- Sample questions:
  - The speed with which I can get a job done is…
  - I consider my vision to be a…
  - My general alertness to what is going on around me is a…

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Self-Awareness of Deficit Interview

- Structured Interview, 3 parts
- Self-awareness of deficits (0 pts= best to 3 no voicing of deficits, only of restrictions)
- Self-awareness of functional impact of deficits (0= accurate, 3= no concept of functional impact except external limits)
- Ability to set realistic goals (0=realistic, 3 = convinced no problems within 6 months)
- Total points scored

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Driving is a Specific Task

- Compare person's self-estimate on a specific task to external reviewer's assessment or performance criteria on that task

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Pilot Study

- Subjects = 5 persons with BI
- SADI
- Topic analysis from "blind" audio tapes
- Most common self-perceived driving problems:
  - Poor memory
  - Fatigue
  - Reasoned might get lost more, but did not understand why driving not just restricted

Home

Exit

Phase 2 STTR study

- Question: Can therapist led simulated driving experiences can alter self-awareness of driving abilities in persons with BI?

- Criteria for Self-Awareness Tool
  - Maskable
  - Short
  - Quantitative

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Exit

Instrument = STISIM Drive®

Home

Exit

Our View of Self-awareness in Driving

- Behaviors
- Skills
- Impact of abilities/deficits
- Developing own strategies to compensate/avoid

Home

Exit

Behaviors

- Maintain speed +/- posted
- Stop completely at stop signs
- Obey traffic lights
- Keep car in lane
- Keep safe distance from car ahead
- Move to far left before turning left
- Signal turns and lane changes
- Check for traffic before changing lanes

Home

Exit

Skills

- Focus on more than one thing at a time
- Remember rules and instructions
- Quickly decide what to do during dangerous situations
- Remain patient and cautious
- Change intention if context changes

Home

Exit

Critical Event Challenges

- Speeding car ignores red light at intersection
- Oncoming car tries to pass truck (head on collision)
- Following slow car –pavement marks offer opportunity to pass:
  - Can pass
  - Can't pass, oncoming cars
  - Can't pass, vehicle behind you passing
  - Can't pass, pavement markings revert to solid lines
- Construction zone - in Assessment only
  - Truck backs out
  - Speed posted too high

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Preliminary Assessment of Tool

- **Concurrent validity** = Compare PCRS score (pt v. OT) to tool scores (subj./investigator)
- **Intra-rater reliability** = Compare Investigator scores of duplicate masked drives
- **Inter-rater reliability** = Compare 2 Investigators' scores of same unmarked drives

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Exit

Preliminary & Phase 2 Protocol

Simulator Sickness Questionnaire

↓

Familiarization Drive (10-15)

↓

Assessment Drive (pre) (15-20min)

↓

Self-awareness Tool (pre)

↓

Therapist Led Intervention (simulated drives)

↓

Assessment Drive (post) (15-20min)

↓

Self-awareness Tool (pre)

Simulator Sickness Questionnaire 2

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Exit

Results

- Concurrent validity
- Intra-rater reliability
- Inter-rater reliability

Home

Exit

Next Steps

Home

Exit

Thanks to

- Our participants
- Kim Briggs, OTS for data collection
- Chris Monnier, Engineering Student for data collection and refinement of critical events
- This study funded as part of NIH STTR # R42 HD037287-02

Concurrent Validity of a Virtual Reality Driving Assessment for Persons with Brain Injury

Linda Hirsekorn
Community Therapists Inc. (Vancouver, British Columbia)

Abstract

Purpose: Driving competency following traumatic brain injury (TBI) is difficult to determine. The purpose of this study was to examine the driving performance of individuals with TBI using the driVR, a PC-based driving simulator, and other commonly used tests of driving ability. The research was intended to serve as a pilot study and though the small sample size and lack of comparison group presented limitations with respect to the extent of statistical analyses, a number of noteworthy findings and recommendations for future research were obtained. This presentation presents and discusses these findings and recommendations.

Concurrent Validity of a Virtual Reality Driving Assessment for Persons with Brain Injury

... continued

Method: A total of 28 adult persons with brain injury participated in a standardized driving evaluation, which included driVR, a PC-based simulator. Concurrent validity of the drivR was examined by comparing driVR measures to other indicators of driving ability, which consisted of on-road, cognitive, visual-perceptual, and driving video tests.

Results/Findings: Interrelationships between the driVR and other indicators of driving ability were identified. Several relationships emerged to support initial evidence for the concurrent validity of the driVR with on-road and driving video tests. Relationships with cognitive and visual-perceptual measures with driving test scores did not emerge, indicating that, consistent with a number of other studies, psychological tests alone may lack the validity to adequately assess the multi-task nature of driving.

Conclusion: The driVR appears to be a useful adjunctive screening tool for assessing driving performance in persons with brain injury, and worthy of further empirical validation.

Home

Exit

Concurrent Validity of a Virtual Reality Driving Assessment for Persons with Brain Injury

Presented by Linda Hirsekorn BSR (OT)

Community Therapists Inc (CTI)

Home

Exit

Research

- Conducted by Jaye L. Wald, MEd, Lili Liu, PhD. & Sue Reil, BScOT
- Published in CyberPsychology & Behaviour Volume 3, Number 4, 2000 MaryAnn Leibert Inc.
- Transport Canada, Strategies for the Integration of the Disabled

Home

Exit

CTI Driver Rehab

- Brain injury rehab programs - 1994
- Removing barriers for clients returning to driving
- Functional Driving Evaluation
- Off-Road Remediation
- On-Road Retraining

Home

Exit

Assessment Tools

- Review of tests - predictive of on-road
- Tests to yield information about driving performance
- Individualized remediation & retraining

Home

Exit

Simulated Driving

- Motion-based simulator - CDAM 1994
- Tech development - driving task analysis
- PC-based driving simulator - driVR 1996
- Validation research - normative data 1996

Home

Exit

Benefits of Simulators

- Assessment in the safety of the clinic
- Opportunity to look at driving performance in a wide range of dynamic conditions
- Ability to collect & store data - evaluation & measure progress
- Potential to screen - not replace on-road

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Simulator Testing

- Adjunct to paper & pencil tests
- First look at functional driving
- Valuable information for on-road testing
- Analyze, interpret & form opinion
- Human rights arbitration

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Purpose of Study

- Conduct pilot study to further validate the driVR
- 3 studies - normative study, discriminative validity study - for brain injury & older adult populations
- Concurrent validity - do scores on the driVR relate to other measures of driving performance?

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Exit

Objectives

- Compare driving simulator scores with other test score
- Identify interrelationships

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Exit

Method

28 persons with brain injury

Compare driVR scores to

- Trail making A & B
- Adult Visual Perceptual Assessment
- Driving video tests
- On-road driving test

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driVR Scenarios

- Practice Route
- Stage 1 - Upper level curved road
- Stage 2 - Downhill residential area
- Stage 3 - Vehicle Following
- Stage 4 - Lower level straight road
- Stage 5 - Traffic merge and collision avoidance
- Stage 6 - Double lane to single lane selection
- Stage 7 - Driveway choice

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driVR Test Scores

- Follow Traffic Event - following pace car
- Shop Road and Opposite Road - maintain lane position
- Stop Signs Missed
- Driveway Choice Event - follow verbal instruction
- Avoid Traffic Event - collision avoidance

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Exit

Results

- Several relationships emerged
- Psychological tests alone lack validity

driVR Inter-Correlation

- Follow-traffic Event - following a pace car & Driveway Event - correctly parking a car

- Opposite Road & Shop Road - measure lane-tracking

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driVR Correlations

- On-road Test 2 with Shop Road & Opposite Road Events
- On-road Test 1 with Shop Road and Opposite Road Events
- Driver Performance Video II and Driveway Event
- Driver Risk Index and Shop Road

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Exit

Future Research

- Replication of these results
- Face validity
- Predictive validity - for on-road driving
- Construct validity of “virtual driving”
- Using driVR for re-training & treatment of anxiety disorders

Dementia and Driving Cessation: An Overview of the Development of Group Interventions for Patients and Caregivers, and Preliminary Results

Bonnie M. Dobbs
University of Alberta (Edmonton, Alberta)

Abstract

The loss of driving privileges has been identified by both patients diagnosed with a dementia and their caregivers as one of the most difficult aspects of the illness. Until recently, there has been little in the way of formal support to assist patients and caregivers in dealing with this loss. The purpose of the presentation is to provide an overview of two new interventions for driving cessation: a psychotherapeutic intervention for individuals with a dementia and a psychoeducational intervention for caregivers. At the end of the study (fall 2004), results from patients and caregivers receiving the intervention will be compared to controls (patients and caregivers receiving traditional forms of intervention). To date, the majority of individuals with a dementia have indicated that the group has helped them cope with not

driving and in talking with their spouse. The majority of caregivers also have indicated that the group has helped them cope with their spouse's illness and with their spouse not driving. There is unanimous agreement from those with a dementia and their caregivers that the groups have made a difference in their lives.

Home

Exit

Dementia and Driving Cessation: An Overview of the Development of Group Interventions for Patients and Caregivers, and Preliminary Results

Bonnie M. Dobbs, PhD, Natalie Dautovich, BA, and Christine Vandenberghe, MEd., Allen Dobbs, PhD, Lori Harper, PhD, Carmel Larabie, BSW, Ava Wood, BHScN, Jean Triscott, MD, Angela Juby, MBChB, Thamarai Moorthy, MA, Sherilyn McIntosh, MED, and Linda Barrett, MPH

6th National Workshop for Driver Rehabilitation Specialists
May 27-29, 2004, Edmonton, Alberta

Home

Exit

Acknowledgements

The investigators acknowledge and thank **Alzheimer Canada** for funding this research.

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Exit

Background

- Older adults the most rapidly growing segment of the driving population
- By 2024: 1:4 drivers will be over the age of 65
- Currently, majority of seniors are licensed to drive, but percentages vary by age and gender

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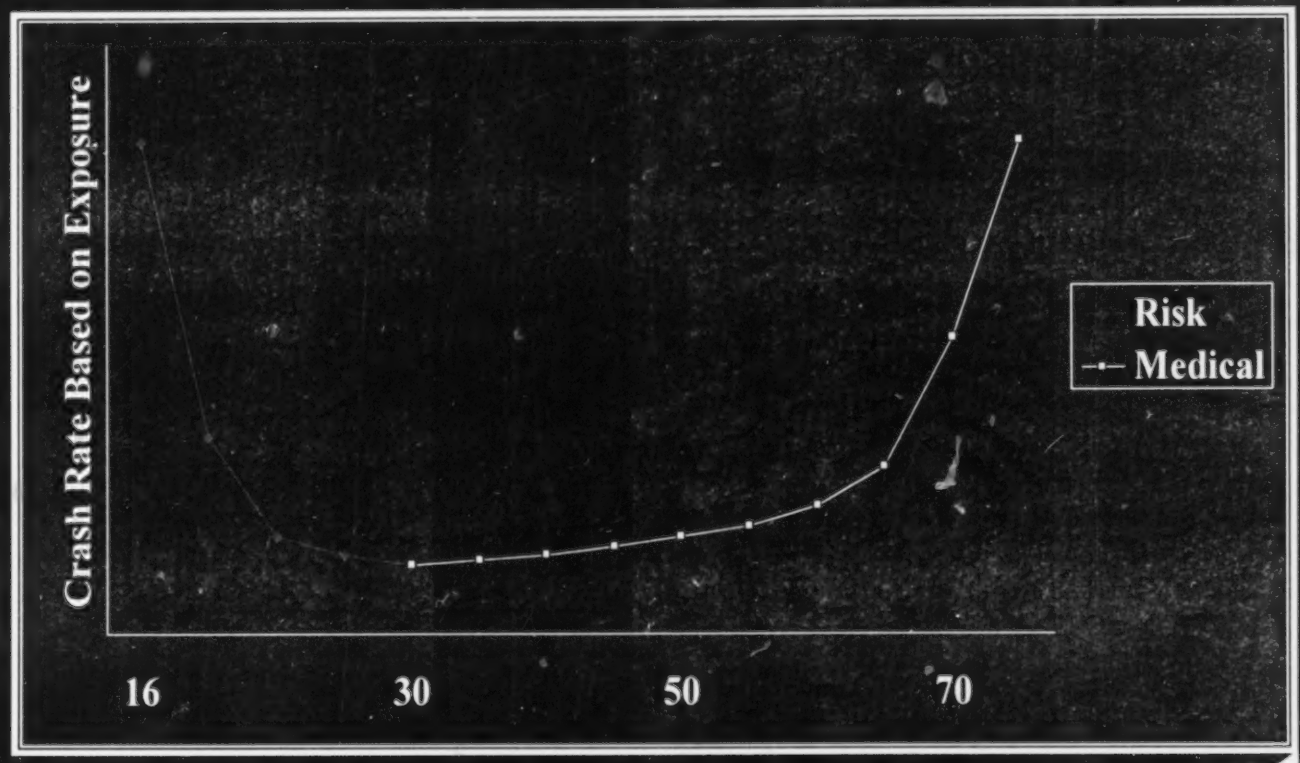
Background to Loss of Driving Privileges

- Based on amount of driving, older driver crash rates rival those of the high risk younger driver



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Who Is Most At-Risk?

- Not 'Older Drivers' but Medically At-Risk Drivers
- A number of chronic medical conditions put individuals at risk (those conditions can occur at any age but are more likely to occur as one gets older)
- Also need to take into consideration the medications that are used to treat those illnesses

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Exit

Who Is Most At-Risk?

- Not 'Older Drivers' but Medically At-Risk Drivers
- A number of chronic medical conditions put individuals at risk (those conditions can occur at any age but are more likely to occur as one gets older)
- Also need to take into consideration the medications that are used to treat those illnesses

Home

Exit

Drivers with a Dementia

- Drivers with a dementia have crash rates that are 5 to 7 times higher than non-dementing seniors
- As many as 2/3 of drivers with early stage dementia are incompetent to drive

Home

Exit

Scope of Problem

- 8% of Canadians 65 and older have a dementia. An additional 17% have some form of cognitive impairment (CSHA, 1994; Graham et al., 1997)
- All individuals with a progressive dementia will become unsafe to drive at some point in their illness
- Loss of driving privileges due to a dementing illness currently affects 132 800 Canadians 65+ (extrapolating from CSHA and Transport Canada data)
- Numbers are projected to increase in the next few decades due to ageing of the population

Home

Exit

Drivers with a Dementia

- Drivers with a dementia have crash rates that are 5 to 7 times higher than non-dementing seniors
- As many as 2/3 of drivers with early stage dementia are incompetent to drive

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- Numbers are projected to increase in the next few decades due to ageing of the population

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Exit

The Salience of Driving

Possession of a Driver's License:

- Actual value
  - Central to independence, autonomy, and mobility
- Symbolic value
  - Asphalt identikit (Eisenhandler, 1990)
  - Provides a non-age related non-stigmatized identity
  - Associated with competence-makes the loss particularly difficult

Home

Exit

Negative Consequences Associated with Driving Cessation for Individual

- Reductions in mobility
- Increased dependence
- Increase in depressive symptoms
- Over 70% of caregivers report that not driving was one of the most, if not the most difficult aspect of the illness for the individual
- Often the crucial event that brings the patient and family members face-to-face with the realities of the disease

Home

Exit

Negative Consequences Associated with Driving Cessation for Individual

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- Over 70% of caregivers report that not driving was one of the most, if not the most difficult aspect of the illness for the individual
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Exit

Negative Consequences Associated with Driving Cessation for Caregiver

- Missing work/giving up work
- Reductions in leisure activities
- Role reversal
- More than 1/3 of caregivers report that stopping driving was one of the most difficult aspects of caregiving

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Exit

Negative Consequences Associated with Driving Cessation for Caregiver

- Missing work/giving up work
- Reductions in leisure activities
- Role reversal
- More than 1/3 of caregivers report that stopping driving was one of the most difficult aspects of caregiving

Home

Exit

Driving Cessation Support Group Study

Designed for:

- Individuals with a dementia who have had to stop driving because of their illness
- Caregivers of those individuals

Home

Exit

Goals of Research

- To assist the individual with a dementia to work through the negative emotions associated with loss of driving privileges
- To assist the caregiver by teaching them how to cope with stressors associated with driving cessation and to teach them alternate means of transportation

Home

Exit

Method

- Experimental Group
  - Patients and caregivers meet concurrently but independently
  - Tuesday 10-11:30 AM, Edmonton General
  - 16 weeks
- Control Group
  - Patients-Edmonton Alzheimer Society Early Stage Support Group (6 weeks)
  - Caregivers-Edmonton Alzheimer Society Caregiver Support Group (6 weeks)

Based on theoretical foundation of stress and coping (Lazarus & Folkman, 1984)

Home

Exit

Methods (Cont'd)

- Patient Group
  - Psychotherapeutic in nature
- Caregiver Group
  - Psychoeducational
- Data collected by Research Assistants in the group sessions

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Themes-Data Analysis

- Individual statements categorized (e.g., confusion about driving referral, driving assessment, symptoms of disease)
- Frequencies assigned
- Statements then ‘grouped’ according to content similarity (e.g., driving, dementia, family, etc).

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Exit

Preliminary Results

Patient Demographics

Age	Gender	Diagnosis	MMSE
74.7 (8.7)	82% (M) 18% (F)	AD=30% VD=12% Other=58%	22.94 (2.51)

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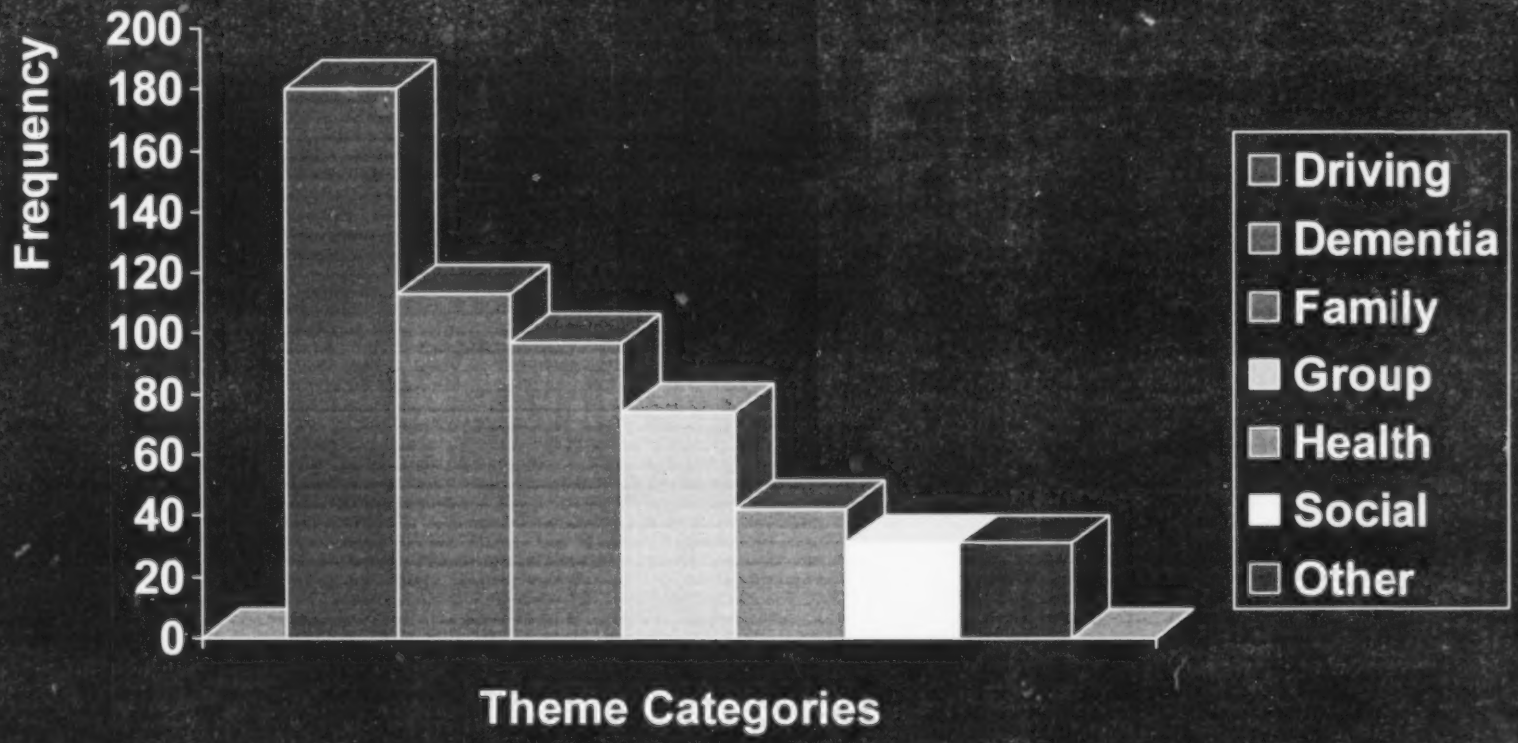
Themes (Patient Group)



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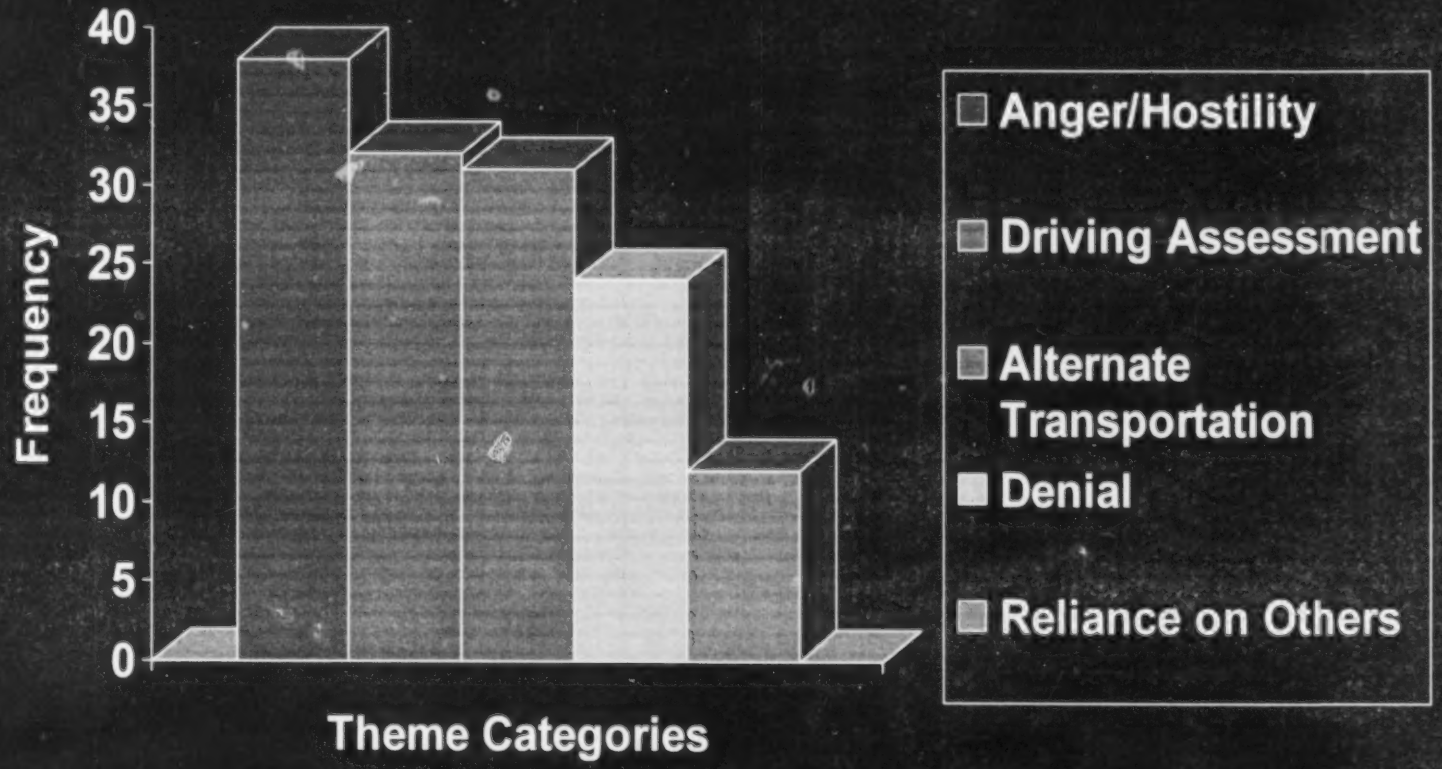
Driving Theme (Patient Group)



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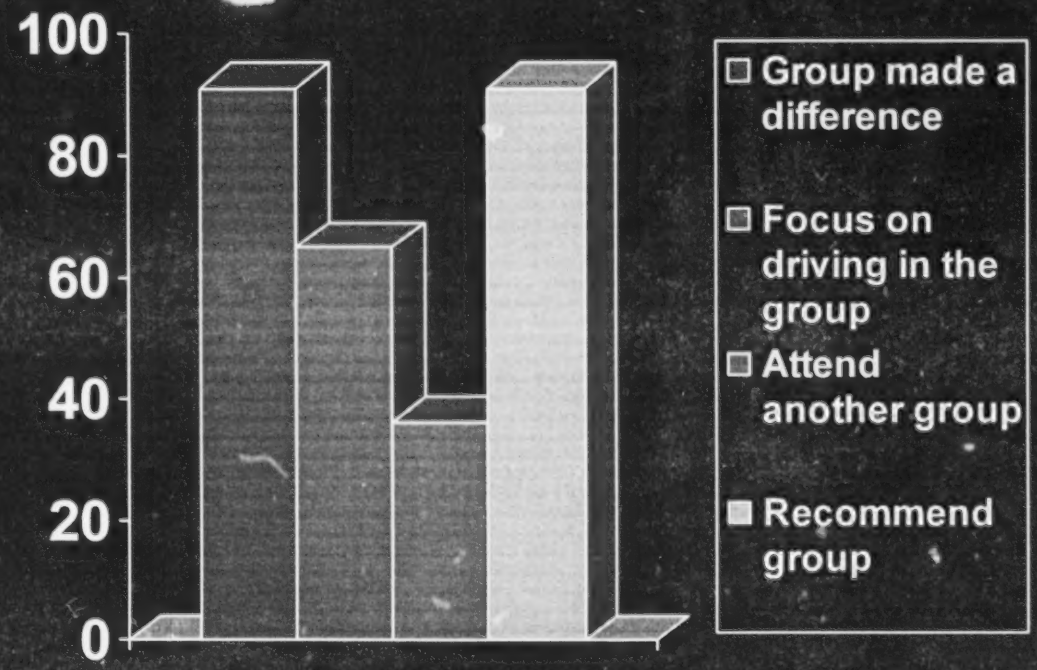
Patient Group Evaluation

Feedback on Group



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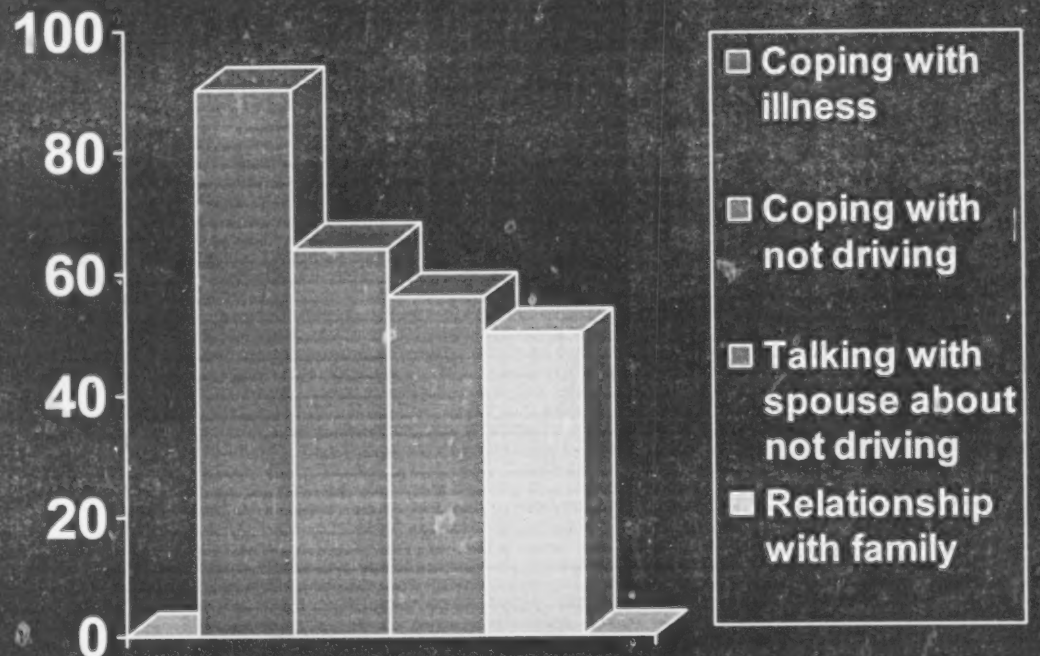
Patient Group Evaluation Cont'd



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Preliminary Results

Caregiver Demographics

Age	Gender	Relationship
66.0 (7.3)	100% (F)	100% (Spouse)

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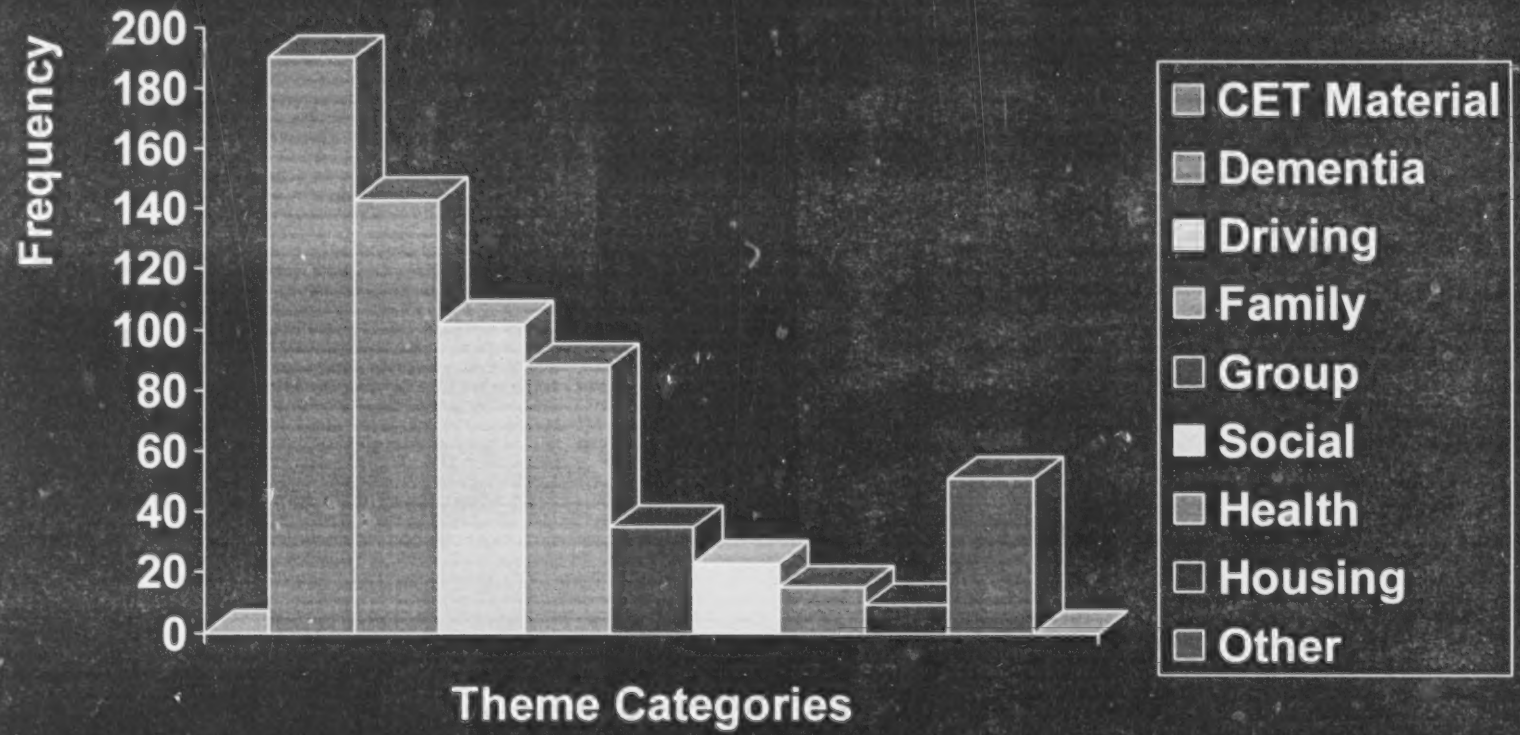
Themes (Caregiver Group)



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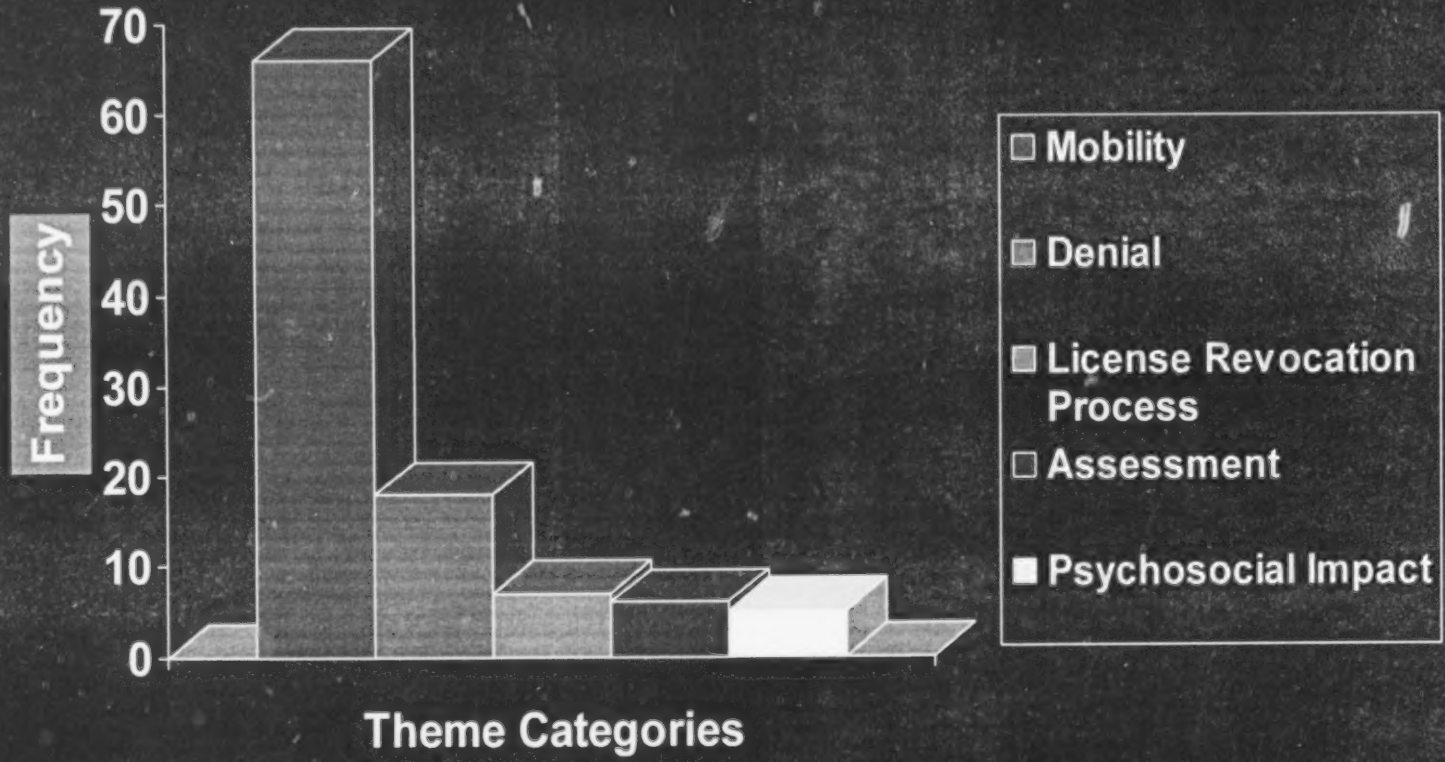
Driving Theme (Caregiver Group)



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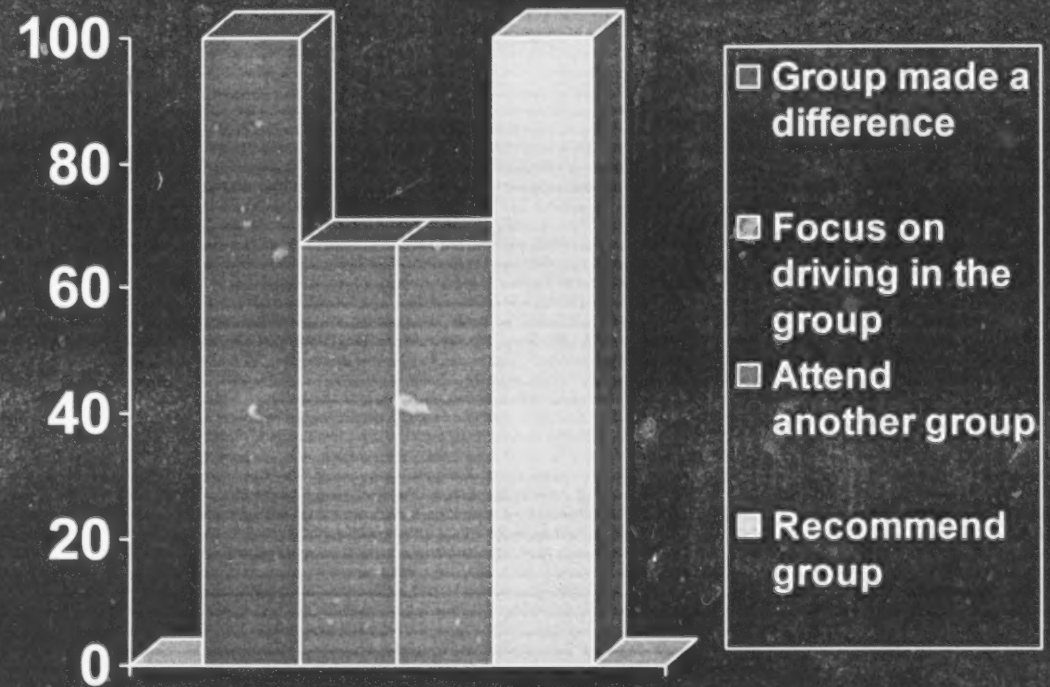
Caregiver Group Evaluation

Feedback on Group



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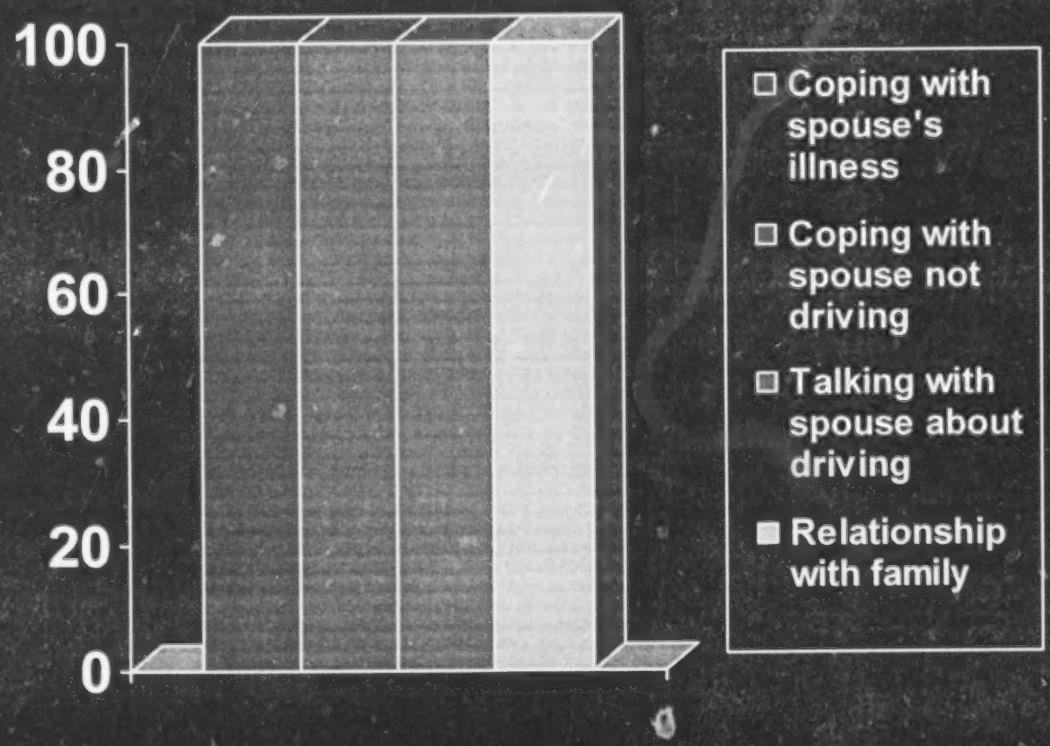
Caregiver Group Evaluation Cont'd

Impact of Group



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Conclusions

- Identification of themes has led to a better understanding of the issues faced both by patients and by their caregivers

- This understanding is critical for development of:
  - Patient and caregiver support groups
  - Educational materials for both groups
  - Educational materials for other stakeholders (Health Care Professionals, Driver Fitness and Monitoring, etc.)

6th National Workshop for Driver Rehabilitation Specialists

Participants

Adamson, Susanne
Occupational Therapist
Regina Qu'Appelle Health Region
2180 23rd Avenue
Regina, SK
Canada S4S OA5

Allen, Joe
President
Kino Mobility Inc.
3–1140 Sheppard Avenue West
Toronto, ON
Canada M3K 2A2

Anderson, Bonnie
Exercise Specialist
Saskatoon City Hospital
701 Queen Street
Saskatoon, SK
Canada S7K OM7

Barrett, Hilary
Occupational Therapist
Millard Health – WCB
131 Airport Road
Edmonton, AB
Canada T5G 0W6

Participants *... continued*

Bennett, Kevin
Shoppers HomeHealthCare
2720 12th Steet NE
Calgary, AB
Canada T2E 7N4

Benoit, Dana
Centre de réadaptation
Constance-Lethbridge
13, rue Cherbourg
Kirkland, QC
Canada H9H 3W5

Bernier, Mylène
Ergothérapeute
Hôpital Charles LeMoyne
5204, avenue Irving
Saint-Hubert, QC
Canada J3Y 5X6

Bogdanovic, Milana
Holy Family Hospital
7801 Argyle Street
Vancouver, BC
Canada V5P 3L6

Bouillon, Louise
Ergothérapeute
Hôpital juif de réadaptation
3205, place Alton-Goldbloom
Laval, QC
Canada H7V 1R2

Bowen, Larry
Coordinator, Driver Rehab Centre
George Pearson Centre
700 West 57th Avenue
Vancouver, BC
Canada V6P 1S1

Participants

... continued

Breckon, Karen
Occupational Therapist
Vancouver Island Health Authority
213–1050 Richardson Street
Victoria, BC
Canada V8V 3C5

Brodie, Judy
Occupational Therapist
Nova Scotia Rehabilitation Centre
1341 Summer Street
Halifax, NS
Canada B3H 4K4

Cright, Annie
Ergothérapeute
Hôpital Charles LeMoyne
3120, boul. Taschereau
Greenfield Park, QC
Canada J4V 2H1

Descent, Micheline
Spécialiste en orientation et mobilité
IRDPQ
525, boul. Wilfrid-Hamel Est, Aile J
Québec, QC
Canada G1M 2S8

Dobbs, Allen
President and Chairman
DriveABLE Assessment Centre
202–10050 112 Street
Edmonton, AB
Canada T5K 2J1

Dobbs, Bonnie
Assistant Professor
Faculty of Rehabilitation Medicine
University of Alberta
Edmonton, AB
Canada T6G 2G4

Duhamel, France
Ergothérapeute
Centre de réadaptation
Lucie-Bruneau
2275, avenue Laurier Est
Montréal, QC
Canada H2H 2N8

Duquette, Josée
Coordinatrice de la recherche
clinique
Centre de réadaptation
Constance-Lethbridge
7005, boul. de Maisonneuve Ouest
Montréal, QC
Canada H4B 1T3

Edwards, Ivor
12–920 119 Street
Edmonton, AB
Canada T6J 7H1

Erickson, Tamara
Occupational Therapist
Foothills Medical Centre
2012 17th Avenue NW
Calgary, AB
Canada T2N 0Z6

Ewanyshyn, Mark
Occupational Therapist
Glenrose Rehabilitation Hospital
10230 111 Avenue
Edmonton, AB
Canada T5G 0B7

Falk, Karen
President
Safety in Motion Inc.
Box 1254
Cochrane, AB
Canada T4C 1B3

Participants

... continued

Fedoruk, Heather
Occupational Therapist
Fort Saskatchewan Health Centre
126 Woodborough Way
Edmonton, AB
Canada T5Y 1N2

Fillion, Gaétan
60, rue du Bon Accueil
Saint-Étienne, QC
Canada G6J 1B3

Finseth, Elaine
Occupational Therapist
Tofield Community Health Services
Box 1200
5543 44 Street
Tofield, AB
Canada T0B 2M0

Fixsen, Jaima
Millard Health
131 Airport Road
Edmonton, AB
Canada T5G OW6

Fuhr, Mitch
Director
Driver Fitness & Monitoring Branch
Alberta Transportation
Main Floor, Twin Atria Building
4999 98 Avenue
Edmonton, AB
Canada T6B 2X3

Participants *... continued*

Gagnon, Jean-Pierre
Conseiller en sécurité routière
Société de l'assurance automobile
du Québec
333, boul. Jean-Lesage
C-4-12, C.P. 19600
Québec, QC
Canada G1K 8J6

Galezowski, Grazyna
Driving Instructor
Easy Way Driving
459 Sly Drive
Winnipeg, MB
Canada R2V 2H3

Garrett, Sheila
Occupational Therapist
Hamilton Health Sciences
Chedoke Hospital
Holbrook Bldg A130
Sanitorium Road, Box 2000
Hamilton, ON
Canada L8N 3Z5

Gauvreau, Angele
Occupational Therapist
Millard Health – WCB
3911 55 Street
Edmonton, AB
Canada T6L 1B9

Participants

... continued

Gehl, Lorena
Occupational Therapist
Glenrose Rehabilitation Hospital
10230 111 Avenue
Edmonton, AB
Canada T5G 0B7

Gélinas, Isabelle
Professeure
Université McGill
570, 8e avenue
Laval, QC
Canada H7N 4H3

Gillespie, Ian
210–1964 Fort Street
Victoria, BC
Canada V8R 6R3

Guercio, Linda
Occupational Therapist
Millard Health
131 Airport Road
Edmonton, AB
Canada T5G OW6

Hamel, Véronique
Ergothérapeute
Institut universitaire de gériatrie
de Montréal
6661, rue Mazarm
Montréal, QC
Canada H4E 2X6

Participants *... continued*

Harborne, Jeanne
Occupational Therapist
Providence Health Care
Holy Family Hospital
7801 Argyle Street
Vancouver, BC
Canada V5P 3C6

Hing, Malcolm
CanDRIVE
Geriatric Assessment Unit
1053 Carling Avenue
Ottawa, ON
Canada K1Y 4E9

Hirsekorn, Linda
Director of Operations
Community Therapists Inc.
228–181 Keefer Place
Vancouver, BC
Canada V6B 6C1

Hrynko, Vivian
Occupational Therapist
Glenrose Rehabilitation Hospital
10230 111 Avenue
Edmonton, AB
Canada T5G 0B7

Hunt, Lynn
Occupational Therapist
The Rehabilitation Centre
505 Smyth Road
Ottawa, ON
Canada K1H 8M2

Impey, Sandra
Occupational Therapist
Complete Rehab and Wellness Services
101–9802 97th Avenue
Grande Prairie, AB
Canada T8V 7K2

Participants *... continued*

Johnson, Linda
Occupational Therapist
Winnipeg Health Sciences Centre
OT Department
RR180, 800 Sherbrook Street
Winnipeg, MB
Canada R3A 1M4

Kazmiruk, Dan
Driver Fitness, OSMV
4A–940 Blanshard Street
Victoria, BC
Canada V8W 3E6

Kennedy, Angela
Program Manager
CanDRIVE
43 Bruyere Street
Ottawa, ON
Canada K1N 5C8

Korner-Bitensky, Nicol
Associate Professor
School of Physical & Occupational Therapy
McGill University
3630 Promenade Sir William Osler
Montreal, QC
Canada H3G 1Y5

Kristalovich, Lisa
Consultant, Occupational Therapist
Community Therapists Inc.
228–181 Keefer Place
Vancouver, BC
Canada V6B 6C1

Participants

... continued

Kyle, Tammy
Occupational Therapist
Swanson and Associates
132 Third Ave
Ottawa, ON
Canada K1S 2K1

Lee, Harry
Driving Instructor
George Pearson Centre
4715 Earles Street
Vancouver, BC
Canada V5R 3R3

Leroux, Carolle
Centre de réadaptation
Constance-Lethbridge
2105, rue Harbour
Laval, QC
Canada H7T 2M5

Longley, Belinda
Reviewing Officer
Driver Fitness & Monitoring Branch
Alberta Transportation
Main Floor, Twin Atria Building
4999 98 Avenue
Edmonton, AB
Canada T6B 2X3

MacGregor, Tracy
Kelowna General Hospital
3523 Landie Road
Kelowna, BC
Canada VIW 3E6

Madsen, Lisa
Occupational Therapist
121–720 Queens Avenue
New Westminster, BC
Canada V3M 1L6

Participants

... continued

Maertens, Nathalie
Ergothérapeute
Centre de réadaptation
Constance-Lethbridge
7005, boul. de Maisonneuve Ouest
Montréal, QC
Canada H4B 1T3

Mark Sinclair, Emily
Robertson Rehabilitation Inc.
103–3310 32rd Avenue
Vernon, BC
Canada V1T 2M6

Marshall, Shawn
CanDRIVE
505 Smyth Road
Ottawa, ON
Canada K1H 8M2

McCarthy, Dennis
Co-Director, National Older Driver
Research and Training Center
University of Florida
PO Box 100164
Gainsville, FL
USA 32610

McLennan, Gloria
Reviewing Officer
Driver Fitness & Monitoring Branch
Alberta Transportation
Main Floor, Twin Atria Building
4999 98 Avenue
Edmonton, AB
Canada T6B 2X3

Meger, Natasha
Occupational Therapist
Kinetik, SCH
701 Queen Street
Saskatoon, SK
Canada S7K 0M7

Ménard, Ingrid
Ergothérapeute
Hôpital général juif
4333, rue de la Côte Sainte-Catherine
Montréal, QC
Canada H3T 1E2

Mercier, Guylaine
Ergothérapeute
CRDP-CA, site Beauceville
253, route 108
Beauceville, QC
Canada G5X 2Z3

Mills, Karen
Occupational Therapist
Whitehorse General Hospital
5 Hospital Road
Whitehorse, YT
Canada Y1A 3H7

Minichiello, Remo
Director, Driver Training
Bridgemont Health
47–53 The Links Road
Toronto, ON
Canada M2P 1T7

Mitra, Cyril
Driver Training Instructor
Glenrose Rehabilitation Hospital
10230 111 Avenue
Edmonton, AB
Canada T5G 0B7

Moroney, Barb
Occupational Therapist
Swanson and Associates
305–1729 Bank Street
Ottawa, ON
Canada K1V 7Z5

Morrison, Carol
Occupational Therapist
Stan Cassidy Centre for Rehabilitation
180 Woodbridge Street
Fredericton, NB
Canada E3B 4R3

O'Neill, Terry
General Manager
Kino Mobility
3–1140 Sheppard Avenue West
Toronto, ON
Canada M3K 2A2

Porter, Michelle
Associate Professor
University of Manitoba
207 Max Bell Centre
Winnipeg, MB
Canada R3T 2N2

Prosdocimo, Angela
Occupational Therapist
St. Joseph's Hospital
335 Caribou Crescent
Thunder Bay, ON
Canada P7C 5Z6

Reid, Nerissa
Occupational Therapist
East Central Health
5318 50 Street
Edmonton, AB
Canada

Reil, Sue
Clinical Services Coordinator
Community Therapists Inc.
228–181 Keefer Place
Vancouver, BC
Canada V6B 6C1

Reimer, Lorna
Manager, Occupational Therapy
Glenrose Rehabilitation Hospital
10230 111 Avenue
Edmonton, AB
Canada T5G 0B7

Robertson, Dean
Robertson Rehabilitation Inc.
103–3310 32rd Avenue
Vernon, BC
Canada VIT 2M6

Robertson, Dianna
Robertson Rehabilitation Inc.
103–3310 32rd Avenue
Vernon, BC
Canada VIT 2M6

Robie, Rick
Driver Program Administrator
Alberta Transportation
Twin Atria Building
4999 98 Avenue
Edmonton, AB
Canada T6B 2X3

Robitaille, Sylvie
Ergothérapeute
IRDPQ
525, boul. Wilfred-Hamel Est
Québec, QC
Canada G1M 2S8

Participants

... continued

Rolin, Shirley
Occupational Therapist
Bridgepoint Health
47–53 The Links Road
Toronto, ON
Canada M2P 1T7

Ross, Noémie
Ergothérapeute
Centre de réadaptation Le Bouclier
11, rue Boyer
Saint-Jérôme, QC
Canada J7Z 2K5

Roy, Cécile
Ergothérapeute
Centre professionnel d'ergothérapie
6960, rue Sherbrooke Est
Montréal, QC
Canada H1N 1E5

Simoneau, Don
Occupational Therapist
Glenrose Rehabilitation Hospital
10230 111 Avenue
Edmonton, AB
Canada T5G 0B7

Sofer, Susan
Occupational Therapist
A.C.T. Inc.
109B–6900 Decarie Boulevard
Montreal, QC
Canada H3X 2T8

Stern, Erica
Associate Professor
University of Minnesota
388 MMC
Minneapolis, MN
USA 55455

Stirling, Glennis
Saskatoon City Hospital
735 Redberry Road
Saskatoon, SK
Canada S7K 4S6

Swab, Elden
Occupational Therapist
Regina Qu'Appelle Health Region
2180 23rd Avenue
Regina, SK
Canada S4S 0A5

Swinton, Luz (Luchie)
Neurorehab, Program Facilitator
Calgary Health Region
Foothills Medical Centre
Special Services Building
1403 29th Street NW
Calgary, AB
Canada T2N 2T9

Tavares, Olga
Manager
Driver Fitness & Monitoring Branch
Alberta Transportation
Main Floor, Twin Atria Building
4999 98 Avenue
Edmonton, AB
Canada T6B 2X3

VanBenthem, Kathy
Professional Education Coordinator
CAOT
3400–1125 Colonel By Drive
Ottawa, ON
Canada K1S 5R1

Participants

... continued

Vrkljan, Brenda
PhD Candidate, OT
University of Western Ontario
School of Occupational Therapy
Elborn College
1201 Western Road
London, ON
Canada N7V 3S6

Whetstone, James
RRP
CDTS Inc.
238 Lakeshore Road East
Oakville, ON
Canada L6J 1H8

Wong-Vo, Betty
Occupational Therapist
Calgary Health Region
3312 1st Street NW
Calgary, AB
Canada T2K 0W4

Wood, Barbara
Occupational Therapist
Hamilton Health Sciences
Chedoke Hospital
Holbrook Bldg A130
Sanitorium Road, Box 2000
Hamilton, ON
Canada L8N 3Z5

Young, Margaret
Occupational Therapist
RR#1, 1021 George Road
Bracebridge, ON
Canada P1L 1W8

6e Atelier canadien pour les spécialistes de la réadaptation à la conduite automobile

Participants

Adamson, Susanne
Occupational Therapist
Regina Qu'Appelle Health Region
2180 23rd Avenue
Regina, SK
Canada S4S OA5

Allen, Joe
President
Kino Mobility Inc.
3–1140 Sheppard Avenue West
Toronto, ON
Canada M3K 2A2

Anderson, Bonnie
Exercise Specialist
Saskatoon City Hospital
701 Queen Street
Saskatoon, SK
Canada S7K OM7

Barrett, Hilary
Occupational Therapist
Millard Health – WCB
131 Airport Road
Edmonton, AB
Canada T5G 0W6

Participants

... suite

Bennett, Kevin
Shoppers HomeHealthCare
2720 12th Steet NE
Calgary, AB
Canada T2E 7N4

Benoit, Dana
Centre de réadaptation
Constance-Lethbridge
13, rue Cherbourg
Kirkland, QC
Canada H9H 3W5

Bernier, Mylène
Ergothérapeute
Hôpital Charles LeMoyne
5204, avenue Irving
Saint-Hubert, QC
Canada J3Y 5X6

Bogdanovic, Milana
Holy Family Hospital
7801 Argyle Street
Vancouver, BC
Canada V5P 3L6

Bouillon, Louise
Ergothérapeute
Hôpital juif de réadaptation
3205, place Alton-Goldbloom
Laval, QC
Canada H7V 1R2

Bowen, Larry
Coordinator, Driver Rehab Centre
George Pearson Centre
700 West 57th Avenue
Vancouver, BC
Canada V6P 1S1

Participants *... suite*

Breckon, Karen
Occupational Therapist
Vancouver Island Health Authority
213–1050 Richardson Street
Victoria, BC
Canada V8V 3C5

Brodie, Judy
Occupational Therapist
Nova Scotia Rehabilitation Centre
1341 Summer Street
Halifax, NS
Canada B3H 4K4

Cright, Annie
Ergothérapeute
Hôpital Charles LeMoyne
3120, boul. Taschereau
Greenfield Park, QC
Canada J4V 2H1

Descent, Micheline
Spécialiste en orientation et mobilité
IRDPQ
525, boul. Wilfrid-Hamel Est, Aile J
Québec, QC
Canada G1M 2S8

Dobbs, Allen
President and Chairman
DriveABLE Assessment Centre
202–10050 112 Street
Edmonton, AB
Canada T5K 2J1

Dobbs, Bonnie
Assistant Professor
Faculty of Rehabilitation Medicine
University of Alberta
Edmonton, AB
Canada T6G 2G4

Duhamel, France
Ergothérapeute
Centre de réadaptation
Lucie-Bruneau
2275, avenue Laurier Est
Montréal, QC
Canada H2H 2N8

Duquette, Josée
Coordinatrice de la recherche
clinique
Centre de réadaptation
Constance-Lethbridge
7005, boul. de Maisonneuve Ouest
Montréal, QC
Canada H4B 1T3

Edwards, Ivor
12–920 119 Street
Edmonton, AB
Canada T6J 7H1

Erickson, Tamara
Occupational Therapist
Foothills Medical Centre
2012 17th Avenue NW
Calgary, AB
Canada T2N 0Z6

Ewanyshyn, Mark
Occupational Therapist
Glenrose Rehabilitation Hospital
10230 111 Avenue
Edmonton, AB
Canada T5G 0B7

Falk, Karen
President
Safety in Motion Inc.
Box 1254
Cochrane, AB
Canada T4C 1B3

Participants *... suite*

Fedoruk, Heather
Occupational Therapist
Fort Saskatchewan Health Centre
126 Woodborough Way
Edmonton, AB
Canada T5Y 1N2

Fillion, Gaétan
60, rue du Bon Accueil
Saint-Étienne, QC
Canada G6J 1B3

Finseth, Elaine
Occupational Therapist
Tofield Community Health Services
Box 1200
5543 44 Street
Tofield, AB
Canada T0B 2M0

Fixsen, Jaima
Millard Health
131 Airport Road
Edmonton, AB
Canada T5G OW6

Fuhr, Mitch
Director
Driver Fitness & Monitoring Branch
Alberta Transportation
Main Floor, Twin Atria Building
4999 98 Avenue
Edmonton, AB
Canada T6B 2X3

Gagnon, Jean-Pierre
Conseiller en sécurité routière
Société de l'assurance automobile
du Québec
333, boul. Jean-Lesage
C-4-12, C.P. 19600
Québec, QC
Canada G1K 8J6

Galezowski, Grazyna
Driving Instructor
Easy Way Driving
459 Sly Drive
Winnipeg, MB
Canada R2V 2H3

Garrett, Sheila
Occupational Therapist
Hamilton Health Sciences
Chedoke Hospital
Holbrook Bldg A130
Sanitorium Road, Box 2000
Hamilton, ON
Canada L8N 3Z5

Gauvreau, Angele
Occupational Therapist
Millard Health – WCB
3911 55 Street
Edmonton, AB
Canada T6L 1B9

Gehl, Lorena
Occupational Therapist
Glenrose Rehabilitation Hospital
10230 111 Avenue
Edmonton, AB
Canada T5G 0B7

Gélinas, Isabelle
Professeure
Université McGill
570, 8e avenue
Laval, QC
Canada H7N 4H3

Gillespie, Ian
210–1964 Fort Street
Victoria, BC
Canada V8R 6R3

Guercio, Linda
Occupational Therapist
Millard Health
131 Airport Road
Edmonton, AB
Canada T5G OW6

Hamel, Véronique
Ergothérapeute
Institut universitaire de gériatrie
de Montréal
6661, rue Mazarm
Montréal, QC
Canada H4E 2X6

Harborne, Jeanne
Occupational Therapist
Providence Health Care
Holy Family Hospital
7801 Argyle Street
Vancouver, BC
Canada V5P 3C6

Hing, Malcolm
CanDRIVE
Geriatric Assessment Unit
1053 Carling Avenue
Ottawa, ON
Canada K1Y 4E9

Hirsekorn, Linda
Director of Operations
Community Therapists Inc.
228–181 Keefer Place
Vancouver, BC
Canada V6B 6C1

Hrynko, Vivian
Occupational Therapist
Glenrose Rehabilitation Hospital
10230 111 Avenue
Edmonton, AB
Canada T5G 0B7

Hunt, Lynn
Occupational Therapist
The Rehabilitation Centre
505 Smyth Road
Ottawa, ON
Canada K1H 8M2

Impey, Sandra
Occupational Therapist
Complete Rehab and Wellness Services
101–9802 97th Avenue
Grande Prairie, AB
Canada T8V 7K2

Johnson, Linda
Occupational Therapist
Winnipeg Health Sciences Centre
OT Department
RR180, 800 Sherbrook Street
Winnipeg, MB
Canada R3A 1M4

Kazmiruk, Dan
Driver Fitness, OSMV
4A–940 Blanshard Street
Victoria, BC
Canada V8W 3E6

Kennedy, Angela
Program Manager
CanDRIVE
43 Bruyere Street
Ottawa, ON
Canada K1N 5C8

Korner-Bitensky, Nicol
Associate Professor
School of Physical & Occupational Therapy
McGill University
3630 Promenade Sir William Osler
Montreal, QC
Canada H3G 1Y5

Kristalovich, Lisa
Consultant, Occupational Therapist
Community Therapists Inc.
228–181 Keefer Place
Vancouver, BC
Canada V6B 6C1

Kyle, Tammy
Occupational Therapist
Swanson and Associates
132 Third Ave
Ottawa, ON
Canada K1S 2K1

Lee, Harry
Driving Instructor
George Pearson Centre
4715 Earles Street
Vancouver, BC
Canada V5R 3R3

Leroux, Carolle
Centre de réadaptation
Constance-Lethbridge
2105, rue Harbour
Laval, QC
Canada H7T 2M5

Longley, Belinda
Reviewing Officer
Driver Fitness & Monitoring Branch
Alberta Transportation
Main Floor, Twin Atria Building
4999 98 Avenue
Edmonton, AB
Canada T6B 2X3

MacGregor, Tracy
Kelowna General Hospital
3523 Landie Road
Kelowna, BC
Canada VIW 3E6

Madsen, Lisa
Occupational Therapist
121–720 Queens Avenue
New Westminster, BC
Canada V3M 1L6

Maertens, Nathalie
Ergothérapeute
Centre de réadaptation
Constance-Lethbridge
7005, boul. de Maisonneuve Ouest
Montréal, QC
Canada H4B 1T3

Mark Sinclair, Emily
Robertson Rehabilitation Inc.
103–3310 32rd Avenue
Vernon, BC
Canada V1T 2M6

Marshall, Shawn
CanDRIVE
505 Smyth Road
Ottawa, ON
Canada K1H 8M2

McCarthy, Dennis
Co-Director, National Older Driver
Research and Training Center
University of Florida
PO Box 100164
Gainsville, FL
USA 32610

McLennan, Gloria
Reviewing Officer
Driver Fitness & Monitoring Branch
Alberta Transportation
Main Floor, Twin Atria Building
4999 98 Avenue
Edmonton, AB
Canada T6B 2X3

Participants

... suite

Meger, Natasha
Occupational Therapist
Kinetik, SCH
701 Queen Street
Saskatoon, SK
Canada S7K 0M7

Ménard, Ingrid
Ergothérapeute
Hôpital général juif
4333, rue de la Côte Sainte-Catherine
Montréal, QC
Canada H3T 1E2

Mercier, Guylaine
Ergothérapeute
CRDP-CA, site Beauceville
253, route 108
Beauceville, QC
Canada G5X 2Z3

Mills, Karen
Occupational Therapist
Whitehorse General Hospital
5 Hospital Road
Whitehorse, YT
Canada Y1A 3H7

Minichiello, Remo
Director, Driver Training
Bridgemont Health
47–53 The Links Road
Toronto, ON
Canada M2P 1T7

Mitra, Cyril
Driver Training Instructor
Glenrose Rehabilitation Hospital
10230 111 Avenue
Edmonton, AB
Canada T5G 0B7

Participants

... suite

Moroney, Barb
Occupational Therapist
Swanson and Associates
305–1729 Bank Street
Ottawa, ON
Canada K1V 7Z5

Morrison, Carol
Occupational Therapist
Stan Cassidy Centre for Rehabilitation
180 Woodbridge Street
Fredericton, NB
Canada E3B 4R3

O'Neill, Terry
General Manager
Kino Mobility
3–1140 Sheppard Avenue West
Toronto, ON
Canada M3K 2A2

Porter, Michelle
Associate Professor
University of Manitoba
207 Max Bell Centre
Winnipeg, MB
Canada R3T 2N2

Prosdocimo, Angela
Occupational Therapist
St. Joseph's Hospital
335 Caribou Crescent
Thunder Bay, ON
Canada P7C 5Z6

Reid, Nerissa
Occupational Therapist
East Central Health
5318 50 Street
Edmonton, AB
Canada

Participants *... suite*

Reil, Sue
Clinical Services Coordinator
Community Therapists Inc.
228–181 Keefer Place
Vancouver, BC
Canada V6B 6C1

Reimer, Lorna
Manager, Occupational Therapy
Glenrose Rehabilitation Hospital
10230 111 Avenue
Edmonton, AB
Canada T5G 0B7

Robertson, Dean
Robertson Rehabilitation Inc.
103–3310 32rd Avenue
Vernon, BC
Canada VIT 2M6

Robertson, Dianna
Robertson Rehabilitation Inc.
103–3310 32rd Avenue
Vernon, BC
Canada VIT 2M6

Robie, Rick
Driver Program Administrator
Alberta Transportation
Twin Atria Building
4999 98 Avenue
Edmonton, AB
Canada T6B 2X3

Robitaille, Sylvie
Ergothérapeute
IRDPQ
525, boul. Wilfred-Hamel Est
Québec, QC
Canada G1M 2S8

Rolin, Shirley
Occupational Therapist
Bridgepoint Health
47–53 The Links Road
Toronto, ON
Canada M2P 1T7

Ross, Noémie
Ergothérapeute
Centre de réadaptation Le Bouclier
11, rue Boyer
Saint-Jérôme, QC
Canada J7Z 2KS

Roy, Cécile
Ergothérapeute
Centre professionnel d'ergothérapie
6960, rue Sherbrooke Est
Montréal, QC
Canada H1N 1E5

Simoneau, Don
Occupational Therapist
Glenrose Rehabilitation Hospital
10230 111 Avenue
Edmonton, AB
Canada T5G 0B7

Sofer, Susan
Occupational Therapist
A.C.T. Inc.
109B–6900 Decarie Boulevard
Montreal, QC
Canada H3X 2T8

Stern, Erica
Associate Professor
University of Minnesota
388 MMC
Minneapolis, MN
USA 55455

Stirling, Glennis
Saskatoon City Hospital
735 Redberry Road
Saskatoon, SK
Canada S7K 4S6

Swab, Elden
Occupational Therapist
Regina Qu'Appelle Health Region
2180 23rd Avenue
Regina, SK
Canada S4S 0A5

Swinton, Luz (Luchie)
Neurorehab, Program Facilitator
Calgary Health Region
Foothills Medical Centre
Special Services Building
1403 29th Street NW
Calgary, AB
Canada T2N 2T9

Tavares, Olga
Manager
Driver Fitness & Monitoring Branch
Alberta Transportation
Main Floor, Twin Atria Building
4999 98 Avenue
Edmonton, AB
Canada T6B 2X3

VanBenthem, Kathy
Professional Education Coordinator
CAOT
3400–1125 Colonel By Drive
Ottawa, ON
Canada K1S 5R1

Participants

... suite

Vrkljan, Brenda
PhD Candidate, OT
University of Western Ontario
School of Occupational Therapy
Elborn College
1201 Western Road
London, ON
Canada N7V 3S6

Whetstone, James
RRP
CDTS Inc.
238 Lakeshore Road East
Oakville, ON
Canada L6J 1H8

Wong-Vo, Betty
Occupational Therapist
Calgary Health Region
3312 1st Street NW
Calgary, AB
Canada T2K 0W4

Wood, Barbara
Occupational Therapist
Hamilton Health Sciences
Chedoke Hospital
Holbrook Bldg A130
Sanitorium Road, Box 2000
Hamilton, ON
Canada L8N 3Z5

Young, Margaret
Occupational Therapist
RR#1, 1021 George Road
Bracebridge, ON
Canada P1L 1W8